THE MODEL ENGINEER

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The MODEL ENGINEER

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SMOKE RINGS

An "Historical" Note

● FROM MR. G. R. MUIRHEAD, who resides on a farm in Hertfordshire, we have received one of those friendly, encouraging letters which add so much pleasure to the task of "running" the "M.E." Mr. Muirhead began his letter by remarking that he had never before presumed to encroach upon our sanctum, but, after reading the editorial notes for January 6th, he cast his mind back to the time when the "M.E." first came into his hands, and how, one way or another, it has been instrumental in guiding his footsteps. He thinks that however pleasurable or gratifying a job may be, a few words of appreciation, from time to time, are a great stimulus, and it was with this thought in mind that he began his letter. And what a letter—nine pages of it! Almost every sentence contains something of interest; and it amounts to a personal history of experiences extending from school-days, through a period of helping with farm implements at home, on to the maintenance of mechanical equipment abroad during the war, and then back home to the farm. All was successfully accomplished on a background of practical mechanical knowledge gained from the "M.E." If we can possibly arrange the space, we intend to publish this letter in full, at some time in the near future, as we feel that many readers will find in it as much inspiration as we have.

Northern Models Exhibition

● UNDER THE above title, the Northern Association of Model Engineers is holding an exhibition at The Corn Exchange, Hanging Ditch, Manchester. This will be open to the public from Friday, March 25th, until Sunday, March 27th inclusive.

The Trade will be represented, and it is hoped that permission will be granted to run a passenger-carrying track. Entries are invited for both the competition and exhibition sections, and entry forms are available from Mr. R. E. Priestley, 9, Ravensway, Bury Old Road, Prestwich.

A Novel Conflagration

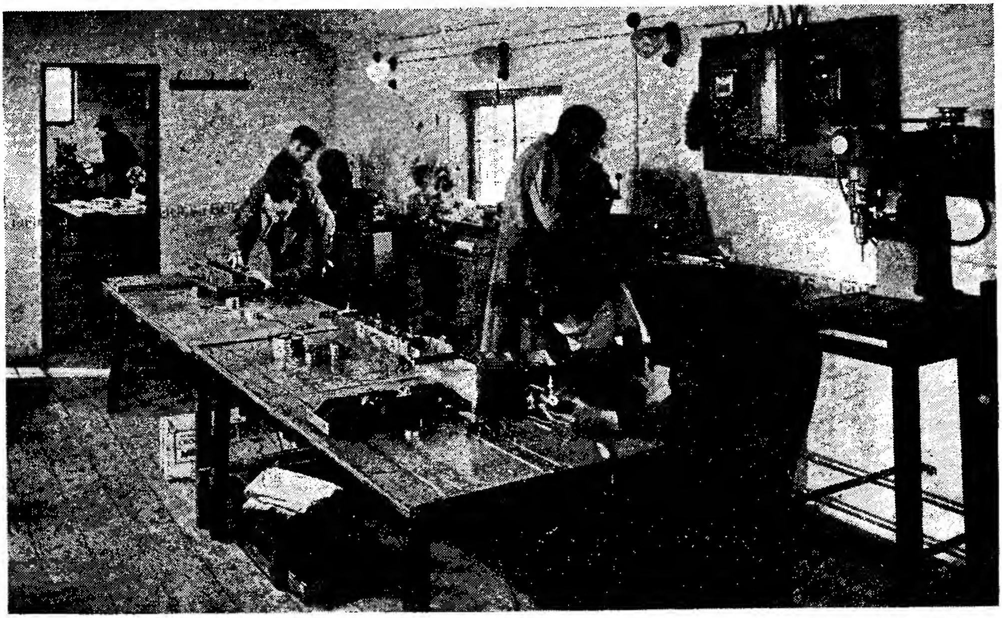
● ON MONDAY, January 17th, British Railways Southern Region engine No. 21-C-154, *Lord Beaverbrook*, suffered a mishap of a kind which must be rare in the long history of locomotive engineering; she caught fire! This incident occurred at Bromley South station just before 9 a.m.; it was clearly not a case of the boiler-clothing becoming overheated and catching fire, but a really serious conflagration which appears to have originated in the oil-bath with which this type of engine is equipped. The station's fire-fighting equipment proved to be inadequate and the Bromley fire-brigade had to be called to the scene. Fifty minutes passed before the

flames could be extinguished, and the engine sustained considerable damage.

We take comfort in the thought that our miniature locomotives are not subject to this sort of thing, and we hope they never will be. To be fair, however, we would add that the Bromley incident is the first that has come to our notice, previous "fires" on this type of engine having been due to patches of oil on the boiler-clothing becoming ignited and burning for a few minutes.

that it is, without doubt, the finest example of its kind that has come to our notice.

It is, of course, a "glass-case" job which is destined to be exhibited at the Cunard-White Star offices in New York; therefore, it is not provided with motive power or any internal fittings. Externally, however, the model is complete with every visible detail of the prototype carefully reproduced to scale. The hull is 21 ft. 7 in. long, which will give readers an idea of the



impressive size and appearance of the model; we feel that the completion of this outstanding example of the modelmaker's art is a fitting means of beginning the fiftieth anniversary of Bassett-Lowke Ltd.

The Myford Model Engineering Society

● SOME MONTHS ago, we reported the opening of this society which has been organised by the Myford Engineering Company in conjunction with their scheme for the training of apprentices in the works. We are now able to publish photographs, one on this week's cover and one on this page, showing the well-equipped workshops which have been allocated to this scheme, which we are informed is working well and is receiving the enthusiastic support of the employees. The equipment in the workshops includes several of the latest M.L.7 lathes, the new M.L.8 woodworking lathe, a milling-machine, drilling machines and electric power grinders. In common with many other engineering forms all over the country, the Myford Engineering Co. have found that model engineering, not only provides excellent training in craftsmanship, but stimulates interest in engineering generally.

A Fine Model of a Fine Ship

● WE HAVE recently visited the Northampton works of Bassett-Lowke Ltd., to inspect a ¼-in. scale model of the Cunard-White Star liner *Queen Elizabeth*. We shall be publishing an illustrated description of this model later on; but, for the moment, we will venture the opinion

A New Bristol Club

● MR. JAMES T. FRASER, 76, Pen Park Road, Southmead, Bristol, informs us of the successful launching of a new club with the rather novel title of "The Bristol 7.4.2 Club." The objects are: to cater for the needs of railway enthusiasts who model in 7-mm., 4-mm. and 2-mm. scales; to pay special attention to newcomers to the hobby and to further the interests of the more advanced modellers. Mr. Fraser is the hon. secretary of the club and will be pleased to supply further information to any readers who may be interested, if they will write to him at the above address.

Major J. T. Holder

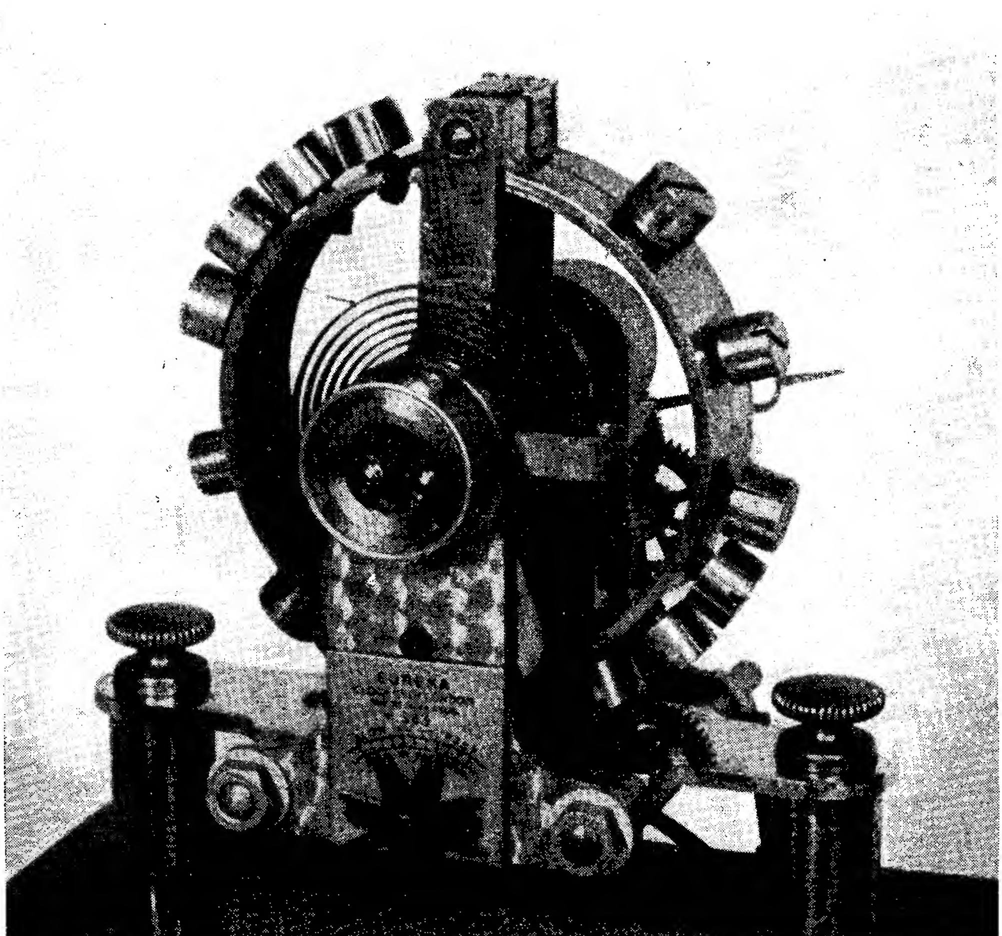
● WE HEAR that Major J. T. Holder has resigned from the position of General Manager of the Romney Hythe and Dymchurch Railway and has joined the staff of Ian Allan Ltd. His genial presence will be missed on the R.H. & D.R., with which little railway he has been so actively associated in recent years. His many friends, however, will wish him well in his new post.

The "Eureka" Electric Clock

by "Artificer"

THE construction of electrically-driven clocks has always been popular among model engineers, and at nearly every MODEL ENGINEER Exhibition, at least one or two specimens of these clocks are represented. But while the workmanship (and presumably, the performance) of these clocks is often extremely good, and some of them exhibit originality and ingenuity in the details of design, there is comparatively little enterprise among constructors in exploring the broad principles of design, and in utilising the many possible forms of escapements and operating mechanisms which have been devised in the past. It is safe to say that about 95 per cent. of the electric clocks which have been built by amateurs have been either of the Hipp or the Synchronome types, with minor modifications in each case; and while both these embody unquestionably sound working principles, and if properly made, work most reliably and keep accurate time, there is a strong case for going farther afield and introducing a little more variety in this branch of construction.

The obvious answer which many amateur constructors will make to this criticism is that the two types of clocks mentioned above are the only ones on which any detailed information on construction is available. This is quite true; of



The "Eureka" clock movement viewed from the rear, showing regulator star wheel

two books on building electric clocks which the writer obtained some years ago, one described a number of different sizes and styles of clocks all using the Hipp escapement, while the other dealt with several Hipp clocks plus one Synchronome master and secondary clock. A third book described in detail the construction of a single

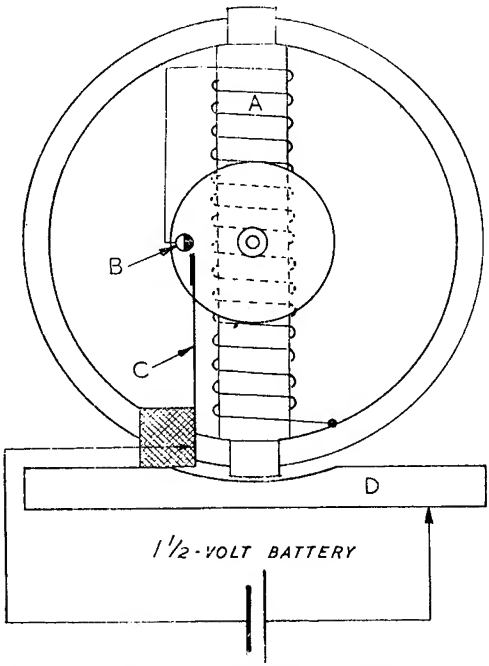


Fig. 1. *Position of balance wheel when at rest*

Hipp clock, while several articles published in THE MODEL ENGINEER and other journals played minor variations on the same old theme. It is in the hope of broadening general knowledge of the working principles of electric clocks, therefore, that the following particulars are given of a type of clock which is notably "different," and despite the fact that it is not claimed to be superior in any way to the popular types of electric clocks, is none the less interesting to the enterprising constructor.

It may further be noted that practically all the electric clocks built by amateurs—with the exception of a.c. mains synchronous clocks, which, one might argue, are not really clocks at all—have so far been pendulum clocks; and while there is nothing one can object to about such clocks from the timekeeping point of view, there is no doubt that they have their own particular limitations. The normal form of pendulum is impracticable in any type of portable clock, and if one had to rely exclusively on it, timekeeping at sea would be impossible unless the clock could be held steady by an elaborate gyroscopic stabilising device. While no form of balance wheel is quite equal in isochronous property to the best form of pendulum, it can be designed so as to show no perceptible inferiority in practice, and it can be compensated for climatic and other variations just as readily as a pendulum.

The balance wheel has been successfully applied to a number of electrically-driven clocks, including some small portable clocks such as those for use in cars or other vehicles. It may, however, be noted that most of the latter may be regarded as more or less normal mechanical spring-driven clocks, equipped with an electric impulse device to wind the spring at regular (and usually frequent) intervals; in other words, they come into a class termed "Remontoire" (self-winding) electric clocks, which present little real interest from the constructor's point of view.

There is, however, at least one notable example of a balance-wheel electric clock in which the driving impulse is applied directly to the balance wheel so that, like the pendulum of the Hipp and Synchronome clocks, it constitutes the actual driving "motor," and transmits power to the wheel train, which serves the function of an impulse counter and indicating mechanism, rather than a heavily-stressed transmission gear. Herein lies the great advantage of the true electrically-driven clock from the aspect of the amateur constructor; the pendulum or balance wheel, together with its escapement, instead of being a delicate and finely-poised piece of

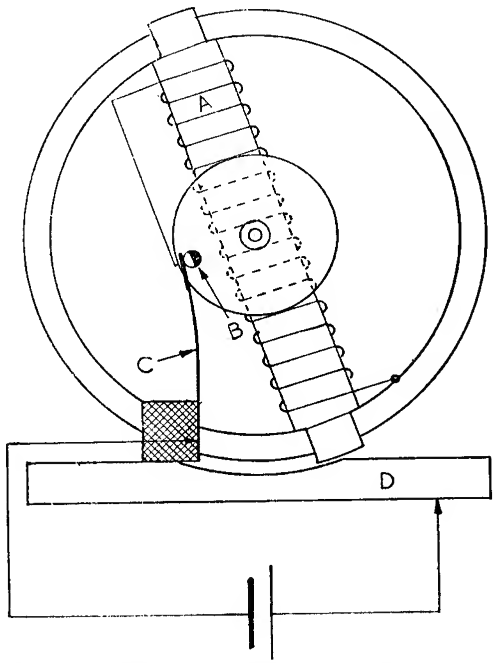
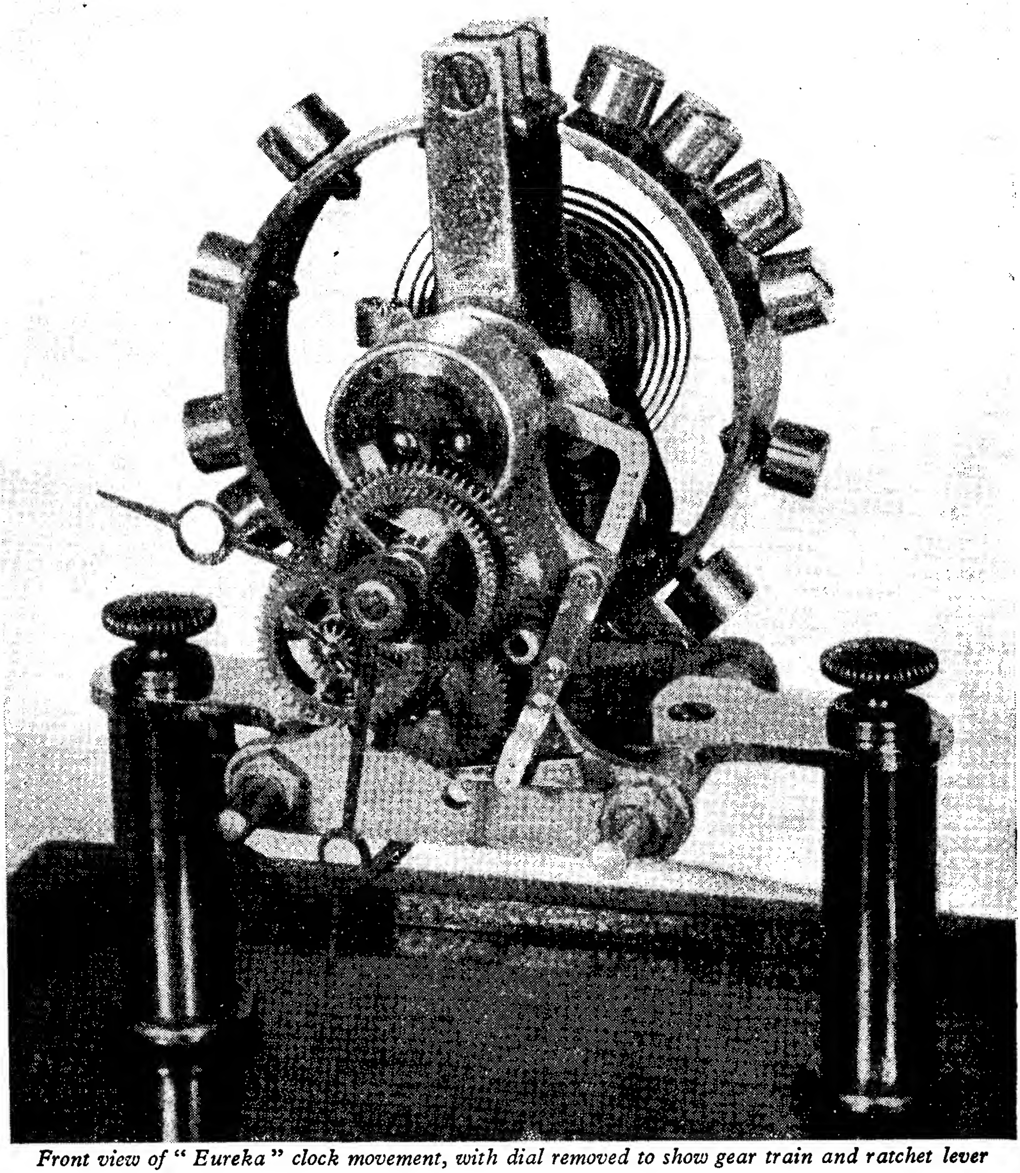


Fig. 2. *Position of balance wheel at the point of making contact*

mechanism, the adjustment of which demands specialised skill, is heavy and robust, requiring comparatively little finesse in either construction or adjustment. This does not mean to say that there is not just as much scope for skill and care in the construction of such clocks as in those of

the weight- or spring-driven type ; but it is a fact that some excellent results have been obtained with electric clocks of quite unsophisticated or even crude design and construction.

The "Eureka" electric clock, which forms the subject of these articles, was invented in 1906, and was put into production by the enterprise of the brothers Kutnow, of "Kutnow's Powder" fame. Its novel and somewhat spectacular design attracted a good deal of attention at the time, but it proved to be a nine day's wonder, and production was abandoned after about five years. There were possibly several reasons for this, not the least being that inevitable teething troubles were encountered in the early stages of production, and it is more than likely that when such faults as developed were referred to clock repairers, the unfamiliar nature of the mechanism prejudiced their chances of receiving conscientious attention. The examples of these clocks which have been encountered, or on which information is available, bear evidence of un-



Front view of "Eureka" clock movement, with dial removed to show gear train and ratchet lever

finished design or tentative experiment, and there are certainly one or two points where the design or workmanship could be much improved. But the clock can at any rate be made to work well and reliably with a very low current consumption, and its inherent timekeeping qualities, though by no means perfect, are probably as good as those of most domestic and portable clocks of the normal type.

Some time ago, the writer was consulted about the repair and restoration of a "Eureka" clock which had been out of use for many years, and—thanks to the ministrations of someone who had tinkered with it at some time in the past—had several essential parts of the mechanism missing. There was, in fact, no visible link-up between the balance-wheel "motor" and the gear train, and though it was not difficult to reconstruct the general design of the missing parts, it was decided that it would be worth while to consult any available information on the original construction of the clock. In the course of this research, which entailed the consulting of all the books on electric clocks which could be unearthed (and incidentally some of them contained totally misleading information, worse than none at all!) and enquiries at South Kensington Museum (much more fruitful) a certain amount of data on this and other unusual types of electric clocks has been acquired. Some further advice has been given on this matter by Mr. F. Hope-Jones, who, as most readers are aware, is a world authority on electric clocks; and as a result, the restoration of the clock in question has been very successfully carried out. In the hope that the matter will be of interest to many readers, an exact record of the design and working details of the clock in its restored form has been prepared, with some suggestions for possible improvement of the design and methods of construction.

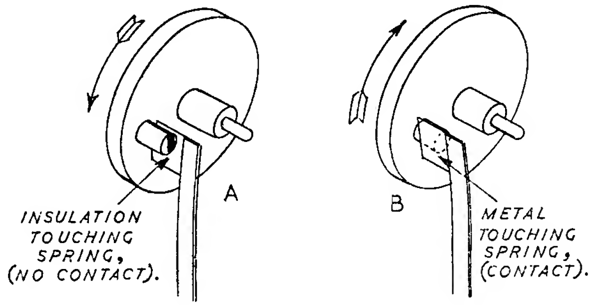


Fig. 3. Action of contact spring on both directions of balance wheel movement

Working Principle of the "Eureka" Clock

The motive power of the clock is obtained from a large diameter oscillating balance wheel, the general form of which is similar to that of a watch balance on an enlarged scale, including the hair spring. This wheel is kept in motion by an electro-magnetic device which operates on the same principle as that in any simple attraction motor. It may here be mentioned that in a clock having the motive power supplied by the pendulum or balance, a fairly substantial mass in the latter is most essential. In this case, the balance wheel is 12 oz. in weight, and the diameter over the rim is $2\frac{7}{8}$ in., the outermost diameter over the complete balance system being $3\frac{3}{4}$ in. The rim is of the bimetal compensated type, and fitted with poise screws; the suspension of the balance is by extended pivots which roll on steel balls enclosed in an oil bath.

An iron bar, *A*, passes diametrically across the balance wheel, forming the "spokes" on which the rim is supported; this is wound with a coil of wire so that it forms an electro-magnet when energised with current from a battery. The supply of current is controlled by a contact device which closes the circuit at the appropriate time. Below the balance wheel is a stationary iron plate, *D*, machined away in the centre so as to provide a fine clearance for the tips of the bar as the wheel oscillates.

When the clock is at rest, the bar assumes a perpendicular position relative to the iron plate, as shown in Fig. 1. The contact pin, *B*, in the cheek of the balance wheel is just clear of the contact spring, *C*, so that no current is passing, and the electro-magnet is inert. It will be noted that the contact pin, *D*, is composed of two half-round sections, the one on the left being of metal and the other of insulating material. The spring, *C*, has an attached tip of contact metal (usually gold-silver alloy), extending sideways, so that the end is shaped like an inverted L. It is adjusted in such a way that the contact pin passes on the right-hand side of it on the upwards swing (see Fig. 3A) and on the left-hand side of it on the downward swing as shown in Fig. 3B; the spring being in each case displaced slightly in the opposite direction. The metal part of the contact pin forms the terminal point at one end of the magnet winding, the other being earthed to the frame of the wheel, and making connection with the main motion frame through the hair spring. Current is supplied from the battery by connecting one terminal to the base of the contact spring and earthing the other to the frame.

If the balance wheel is now set oscillating by hand, the first swing in the anti-clockwise direction will carry the contact pin past the spring with its insulated portion in contact, so that no current passes. But on the return (clockwise) swing, when the position shown in Fig. 2 is reached, the contact pin will again touch the spring, this time on the metallic side, so that a connection is established through the windings of the electro-magnet, which becomes strongly energised, just as its tip is approaching the concave portion of the iron plate. The result is to cause a powerful attraction of the electro-magnet to the centre of the plate, but by the time it reaches this point, contact will be broken between the pin and the spring, so that the balance wheel will continue to move under its own inertia until this is counteracted by the hair spring. This starts it on the return swing, and the cycle of

(*Continued on page* 130)

THE TOOLS FOR THE JOB

by J. W. Tomlinson

THE use of the right tools is half the battle with any job. There are plenty of occasions in model engineering where the method used and the results obtained, are governed by the choice of tools, and if the modelmaker is not an engineer by trade, he may have difficulty in selecting just the right ones. This article gives a few notes on which tools to use for carrying out some of the more general operations performed in model engineering.

Cutting Sheet Metal

Sheet metal can be cut with scissors, tinsmiths' snips, hacksaw, hammer and chisel, by drilling, or welding cutter, according to the type of metal and its thickness. Thin brass, copper, aluminium, tinned-iron and mild-steel, up to 0.015 in. can be cut with a good pair of scissors, although it might be hard going with the latter two. Snips should be used for metal from 0.015 in. to $\frac{1}{16}$ in. thick, and a good pair of snips can be used on the softer metals up to $\frac{1}{8}$ in. When we get into

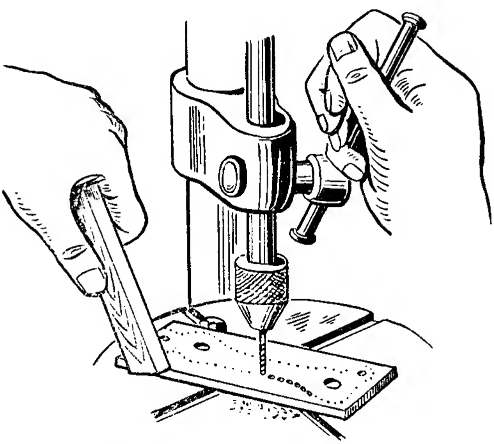


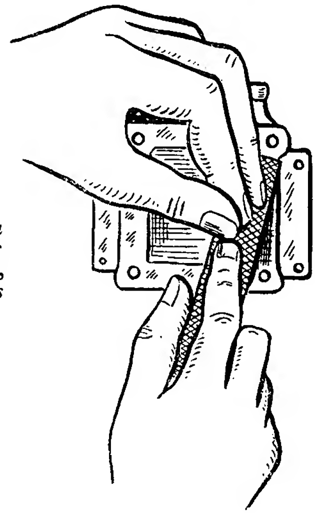
Fig. 1. For producing shapes in thick sheet metal, first drill and then finish with a file

the region of $\frac{1}{8}$ in. thick, it is a matter for the hacksaw or the hammer and chisel, unless, of course, a shearing machine is available.

Anything much above $\frac{1}{8}$ in. thick begins to get a bit cumbersome with the hammer and chisel, and tends to bulge the metal; this leaves us with the hacksaw, welding cutter, or the drill. As a matter of fact, drilling is useful for all thicknesses when intricate shapes are required, and can be used even for metal $\frac{1}{2}$ in. thick, although the modelmaker is not likely to use much metal of this thickness. With these very thick pieces, the marking-out and the size of the hole is very important. The holes are joined with hammer and chisel or hacksaw, and the shape is finished off by filing.

The formation of a flat gas-tight surface, can offer no end of trouble if the right tools are not used. Too big a file or the wrong type of scraper may even cause the job to be scrapped. Joint faces which have to be bedded to form a gas seal,

Fig. 2. Use a small file for surface-bedding, and hold as shown



such as a cylinder-head joint, should be machined, filed, and scraped. The final cut on the machine should be very light and taken at high speed. In high-class engineering, a diamond cutter is used, eliminating the necessity of any further work on the surface.

Fig. 3. Chalk rubbed on a smooth file will prevent scratching

If the surface has been machined extremely accurately, it can be scraped right away, and bedded to a surface plate or the mating part, using a marking medium such as non-drying Prussian blue or lamp-black and oil. Scraping should not be started unless the surface is to at

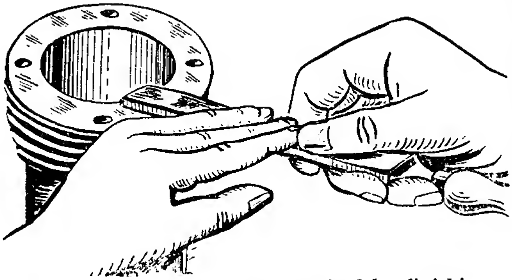


Fig. 4. A good bed can be acquired by finishing with emery-cloth stretched over a file

least 75 per cent. of the required standard. Using the scraper too soon will take much more time to finish the surface and most likely cause "chopping."

The type of file used is important. Most people know that to file perfectly flat is an accomplishment, but a lot of this skill depends on the right file being used, and held in the right manner. Too large a file will cause "rocking" which produces a convex surface, so use a file as small as is practicable and hold it as shown in Fig. 2. The right cut of file is also important; a smooth file should not be used for filing aluminium, as this will "pick up" and scratch; this will also happen on steel if care is not taken. A second-cut file should be used whenever possible, and with a strip of smooth emery-cloth stretched over it for the last few rubs prior to scraping. If one has to use a smooth file, no other being available, "picking up" can often be prevented by rubbing chalk over the file (Fig. 3), or wetting it with water. In every case, to ensure a good finish, the file must be continually brushed clean with a file card. Quite a good flat surface can be acquired by using smooth emery-cloth stretched over a file.

If a scraper is used, it must always be kept sharp, and it should be ground and sharpened with a slight curve across the cutting edge (Fig. 5), which will help to prevent "chopping." It is best to sharpen the scraper as shown in the illustration, and then finish off with a couple of rubs on each side to remove the sharpening burrs. A good medium grade carborundum stone or India stone is to be recommended, and the best size for the modelmaker is 8 in. × 2 in. × 1 in.

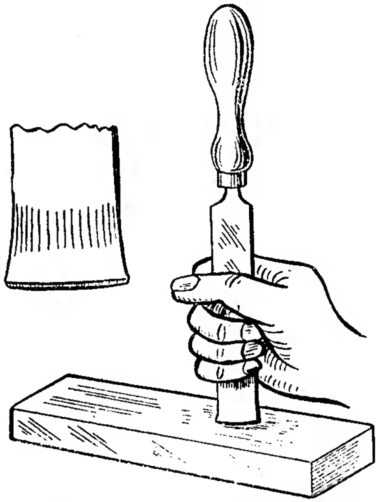


Fig. 5. Hold the scraper as shown, and sharpen with a slight curve across the cutting edge

Drilling

Drilling can cause a lot of trouble if the right type of drill is not used. There are drills which will go straight through a hardened file or ball-race. Should the model engineer attempt to drill these items, he must be sure to get the right type of drill.

If an ordinary twist drill is used for drilling wood, it is bound to run out of centre, and this is a catastrophe when drilling such things as wheels. If the proper type of drill is unavailable, the job should not be attempted unless some form of guide is arranged to prevent the twist drill running.

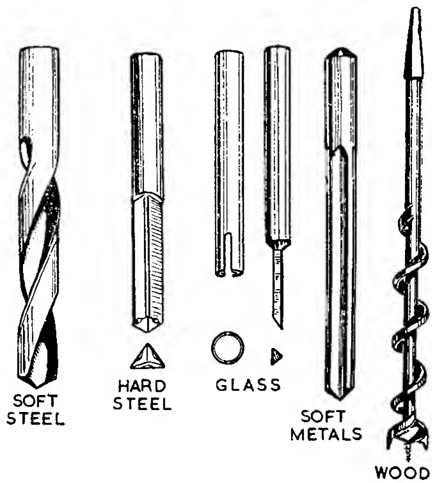


Fig. 6. Several types of drill

Glass can be drilled with a twist drill, but it is much better to use the type shown in Fig. 6. For drilling soft metals, a straight-fluted drill is best, but if a twist drill is used, care should be taken to see that the point is ground to the correct angle for soft metals. When a twist drill is used for drilling stainless-steel, the speed and feed is most important. The speed must be slow and the feed heavy, otherwise the drill will put a hard surface on the metal, which in turn will immediately take the cutting edge off the drill. The best type of drill for piercing stainless-steel and hard metals such as ball-races and hard files is the stellite-tipped drill shown in Fig. 6. These drills may be too expensive in some cases, but where a lot of hard drilling is to be done, they are well worth the money.

The operating principle of this type of drill is rather interesting. The pressure exerted on the drill sets up intense local heat which softens the steel immediately under the drill point. As stellite has a remarkable degree of red hardness and does not soften with such heat, the drill is unaffected and continues to cut satisfactorily. A heavy pressure must be maintained to keep up the cutting action. The drills can be sharpened on an ordinary grindstone and they can be used for counterboring and producing flat-bottomed holes.

Enlarging Holes

It is sometimes a good idea to drill holes smaller than the finished size, this will allow for the hole to be drawn should it be out of place.

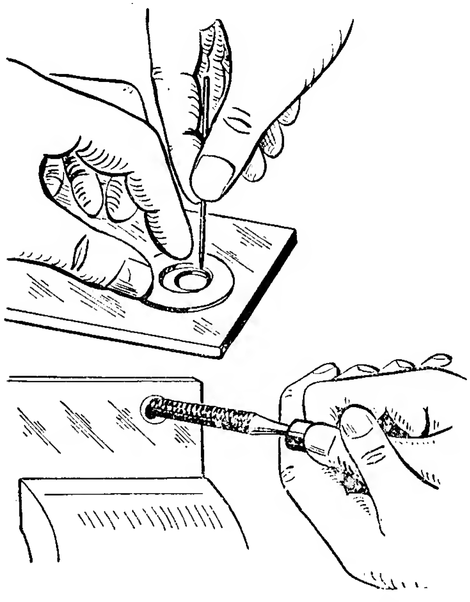


Fig. 7. Holes which are out of position can be filed out, using a washer and scriber for marking

The size of the hole should, of course, be scribed on the metal before it is drilled, but where this has not been done, a suitably sized washer can be placed over the hole, and the size and position marked with a scriber. The hole can then be finished with a round file. See Fig. 7.

Enlarging the bores of bushes must be tackled with the right tools, or the job will be scrapped. It is bad practice to try to ream a bearing bush with an ordinary reamer. A pilot reamer should be used (Fig. 8); this will ensure that the bush is accurately in line. An expanding reamer can be used, but this will require more skill and only a small amount of metal should be removed at a time.

For making a taper hole suitable to take a taper pin for securing such things as control levers, the hole should first be drilled to the smaller diameter of the pin, and finished off with a taper broach, see Fig. 9. A taper reamer

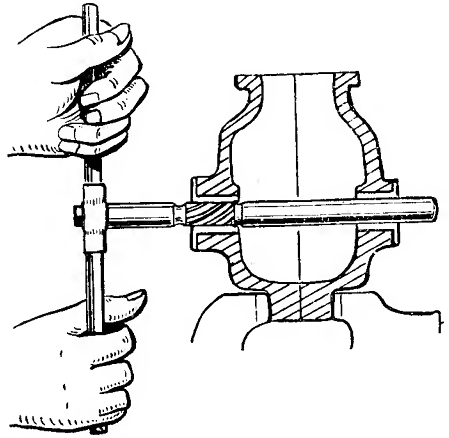


Fig. 8. A pilot reamer should be used for reaming bushes in line

can be used, but a broach is cheaper to buy and does the job just as well.

Tapping

For tapping steel, especially the tough varieties, three taps should be used, a full taper, a half taper, and a plug tap. This will help to avoid breakages and produce a better thread. Lard oil is quite a good lubricant for tapping steel. Two taps, a half-taper and plug, should be sufficient for tapping brass and its alloys and they can be tapped dry, and when tapping aluminium alloys, three fluted taps are best, using a half-taper and plug, with lard oil as a lubricant. It is also advisable when tapping aluminium to use taps 0.002 in. undersize up to ½ in. diameter. This will give a good fit to the stud and help to avoid " pulling " of the thread.

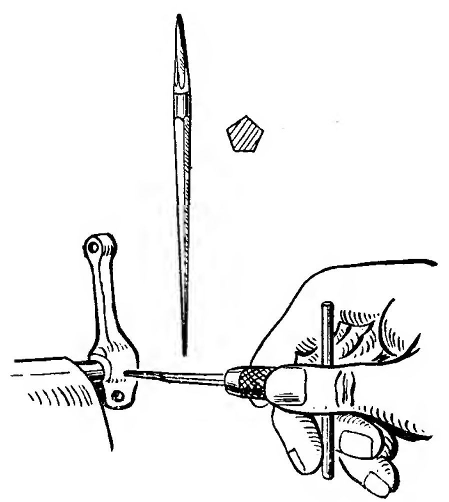


Fig. 9. A taper broach for reaming out taper pin-holes

Outside Help

There is no doubt that the key to good model making is knowing the right tools and knowing how to use them. Of course, methods will vary according to the facilities at hand, but the model engineer should not close his eyes to outside help. He may spend hours shaping parts which could be done much better and quicker if the right equipment was available, and this can often be had by joining or forming an association and making use of a common workshop. The workshop would contain such items as a welding plant, and equipment for brazing and machining. Failing this kind of self-help, in most towns there are several small engineering concerns who would carry out welding and machining operations which are outside the scope of the individual.

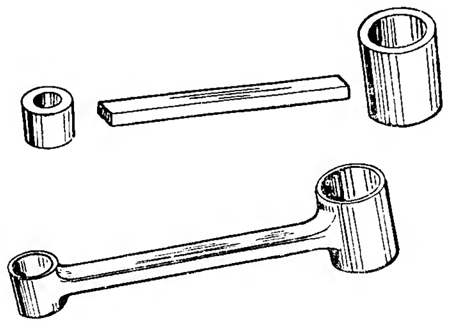


Fig. 10. *A fabricated connecting-rod, made by welding steel tube to rod*

The use of welding for the modelmaker should not be overlooked. Welding has made great strides in general engineering where parts which took many weeks to make, can now be made in a matter of hours. This is due to "fabrication." Take for instance a model connecting-rod; instead of making this out of one piece, two short pieces of steel tube are welded to each end of a piece of steel rod, the ends then trued up and reamed (see Fig. 10). This is a much quicker way and can be just as good in every aspect. There are many parts which at one time had to be cast or forged and are now made by welding several pieces together. This method is invaluable in model making, for it often happens that it is a one off job, in which case pattern making and casting is a slow and expensive job.

The "Eureka" Electric Clock

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events is then repeated indefinitely, so long as current is available to energise the magnet.

It will be quite clear that an essential feature in the function of the clock is that current must only be supplied during the time the magnet is approaching the centre of the iron plate, therefore contact must only be made on one direction of swing. If contact took place on the reverse swing, it would produce an impulse equal and opposite to the first, tending to stop the motion of the wheel. This point is emphasised because it has been stated by one writer in a published description of the "Eureka" clock that impulse takes place in *both* directions of swing; a statement which caused considerable perplexity when the working of this clock was first investigated by the writer, until it was proved that such action was quite impossible with the form of contact mechanism shown.

The strength of the impulse will be dependent on the e.m.f. supplied by the battery, so that any variation in the voltage, as caused by a gradual running down or deterioration will affect the applied power, and to some extent, the rate of the balance. But the isochronous characteristics of the latter will be similar to those of an ordinary watch balance, which tends to compensate variations of power by altering the arc of its swing, and timekeeping errors from this source are not serious, unless one insists on high precision standards. It would not be impossible, however, to improve on this detail, and introduce a constant-impulse form of contact device if so desired.

So far, only the operation of the balance wheel "motor" has been considered, but obviously some method of "counting" the impulses of the wheel and using them to drive the hands of the clock is essential. The gear train employed for this purpose differs in no practical respect from that of an ordinary clock, but what would normally be the escape wheel is in this case a ratchet wheel, which is fed one tooth at a time by a lever and pawl deriving its motion from the balance wheel system. This is done by providing an eccentric on the staff of the balance wheel, and a large diameter roller resting on the latter, and mounted on a pivot at one end of the lever. The ratchet mechanism is clearly visible in the photograph taken from the front side of the clock, with the dial removed; this part of the clock is of course essentially similar to that of the Hipp, Synchronome and many other electric clocks.

The balance wheel is regulated by the usual method of controlling the free length of the hair spring, a rather elaborated geared quadrant being fitted for this purpose, and operated from a pinion with a star wheel on the outside of the motion plate, as seen in the photograph taken from the rear side.

(*To be continued*)

THRUST-BEARINGS

by "Don"

TO the engineer, loads are divided into two classes, journal or radial which act on the bearing at right-angles to the shaft, and thrust or axial loads which act parallel to the latter.

My previous articles have been concerned, in the main, with bearings designed for dealing with the first condition. I now propose to deal with units whose primary duty is to cater for the latter case only, or combinations of the two. Historically, the pure thrust-bearing was probably one of the first real labour-saving devices invented by man, since it is assumed that the

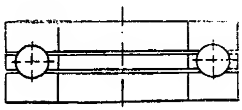


Fig. 1

Egyptians used some form of rollers for transporting the tremendous blocks of stone used in the construction of the pyramids. Certainly, the use of roughly circular tree trunks with the branches removed, have been used for centuries for the easy transportation of objects too large for the primitive methods of locomotion available in days gone by. With the advent of the mechanical age (18th and 19th century) many forms of thrust-bearings were evolved, some good and some fantastic, bearing in mind the crude forms of machine tools then available. Gradually, the washer-type thrust-bearing, as we now know it (Fig. 1), emerged from these designs.

Washer-type Thrust-bearings

As stated above, the bearing shown in Fig. 1 is generally accepted to be the basic type, and all others are some modification or development of this. It is suitable for thrust loads in one direction only, and, as will be explained a little later in the article, must not be run at too high a speed. The construction is simple, consisting merely of two grooved washers containing the cage and balls. It is available in light, medium and heavy types (selection being a matter of choosing the appropriate bearing to deal with the anticipated or calculated load. These details are tabulated in the manufacturers catalogues). The light series would normally be of greatest interest to model engineers, these are available from as small as a ½ in. in the bore, as standard. Usual mounting practice is to locate the bore of one washer, and the outside diameter of the other, and since in the smaller sizes the top and bottom washers are identical (for manufacturing reasons) the shaft and the housing must be arranged so that this is accomplished. Fig. 2 shows a typical application to a small drilling machine. As arranged, the bearing caters for the whole of the thrust load from the drill. It will be noted that the shaft and also the housing (in this case, also a dust-cap) are relieved as described above.

Variations of the basic design are shown at Fig. 3. Fig. 3A is identical with the above with the exception that the ball tracks are omitted. The washers are thus flat on both faces and the bearing is known as the flat-washer type thrust-bearing. It is intended for very light loads and low speeds and is especially suitable where minimum friction conditions are required. Due to its construction, i.e., the ball has only point contact with the washers, lubrication is not of paramount importance, and the bearing is very suitable for such applications as door hinges, etc. Fig. 3B shows a normal washer-type bearing but in this case, the bottom washer has a sphered back face making contact with an equivalent sphered seating. This device gives a self-aligning action to the bearing, which is particularly useful in those arrangements where perfect shaft alignment cannot be guaranteed. As with the previous bearings, this unit is for thrust in

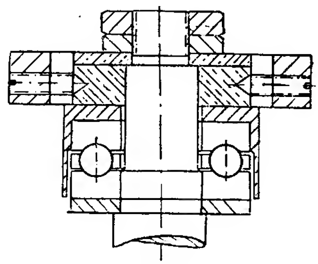


Fig. 2

one direction only. Fig. 3C is an elaboration of the previous scheme with the seating having an extended portion which completely shrouds the bearing. Fig. 3D is a form of double thrust-bearing designed for taking thrust loads in either direction. The two outside washers must be located on the shaft, the centre washer likewise in the housing. The latter should also be located endwise so that the thrust loads in either direction are transferred to the housing *via* this washer. Fig. 3E illustrates a self-contained thrust-block which is supplied complete by the manufacturer, with the exception of the shaft nuts. This contains a self-aligning double thrust-bearing with the centre washer locating on the shaft. The flange is usually left undrilled so that this may be done by the customer to suit the job to which it is fitted.

When the load is in excess of the capacity of the appropriate sized ball thrust-bearing, or where the latter would be of an impossibly large size to accommodate it, then a roller thrust-bearing as shown at Fig. 4 may be fitted. A roller, by reason of the fact that it contacts the track for the whole of its length, whereas a ball makes only point contact, has a load-carrying capacity of at least twice that of the equivalent sized ball,

and a roller thrust-bearing is, therefore, eminently suited for highly-loaded applications where space is of vital importance. A bearing, similar in construction to the one shown in the illustration, is fitted as standard to the blade roots of a well-known variable pitch, constant speed propeller to cater for the very heavy thrust loads caused by the centrifugal force of the blades, whilst many more have been fitted to such diverse units as crane hooks and mechanical stokers.

amount of radial clearance. A glance at Fig. 5A will help in the understanding of the next few remarks. This shows an exaggerated section of the bearing, and it will be clear that the greater the radial clearance, the farther the inner ring will move axially in relation to the outer. This results in a greater angle of contact between the ball and the track (measured from the vertical centre-line) and a consequent increase in thrust capacity. In actual practice it is usual to specify

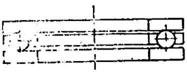


Fig. 3A

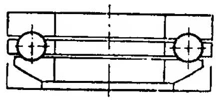


Fig. 3B

Fig. 3C

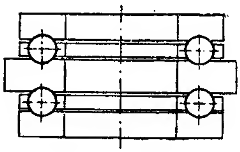


Fig. 3D

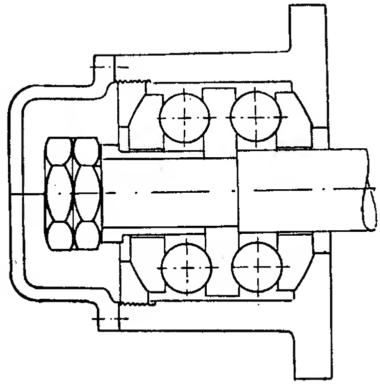


Fig. 3E

Some few years ago it was noticed that in certain applications, particularly where the speeds had been appreciably increased, thrust-bearings were failing with monotonous regularity; in every case the fault was the same, to wit, the frittering or breaking down of the outside edge of the track. After a good deal of research, this was found to be due to the fact that the balls were being thrown outwards by the centrifugal force, and, because the tracks on these bearings are comparatively shallow, this was causing the

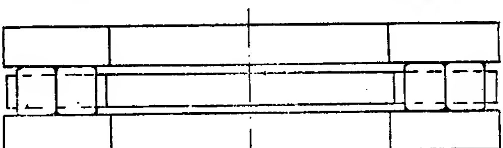


Fig. 4

excessive wear and ultimate failure in a very short space of time. The double thrust-bearing, Fig. 3D, is very prone to this type of failure because one row of balls is always unloaded, and it is for this reason that the bearing is unsuitable for high speeds. A further glance at Fig. 3D will clarify this point. From the foregoing, therefore, two points emerge:

(1) Speeds should not be excessive.
(2) The bearing should always be under a definite thrust load when revolving.

These rules apply, of course, to all forms of ball thrust-bearings.

Other Thrust Units

The single-row ball journal-bearing may also be used as a pure thrust unit, but if used for these duties, it is essential that it have the maximum

0.000 in. fit when the bearing is required for these duties, this gives an angle of contact of approximately 15 deg. If the unit is required to be free of all journal loading, then the housing bore above it must be relieved and a further bearing (usually of the roller journal type) introduced to accommodate this. A typical arrangement illustrating these points is shown at Fig. 5B. The normal ball journal described, suffers from one disadvantage, and this is, that owing to its construction, i.e. full depth of track on both inner and outer members, only a certain

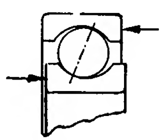


Fig. 5A

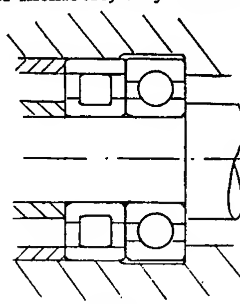


Fig. 5B

limited number of balls can be assembled. This, of course, reduces the load-carrying capacity (since this is dependent on the number and size of balls fitted) and it was for this reason that the angular contact bearing shown in Fig. 6 was developed. This bearing has a shallow track at one side of the outer ring; consequently, the maximum number of balls can be assembled. I have described this bearing in detail in a previous article; it is sufficient, therefore, to say that it can be, and is, used for pure thrust

duties. As stated previously, a single bearing is only capable of dealing with loads in one direction (due to the shallow track at one side). Where these thrust loads may be reversed, two bearings must be fitted, preferably back to back. The "duplex" double-purpose bearing as shown at Fig. 7 is, on the other hand, capable of dealing with reversing thrust loads. It is a full-capacity unit and is supplied with a two-piece inner as shown. Alternatively, it may be supplied with a two-piece outer, this depending on the manufacturer. A study of the enlarged section at Fig. 7A will show the form of construction. Each quarter track radius is struck from a point 35 deg. from the vertical ball centre-line. When the bearing is working, this causes the ball to contact opposite inner and outer tracks across this 35 deg. line.

A further study will show that whilst the left-hand inner and the right-hand outer track are contacting the ball, the opposite ones are clear; when the load is reversed, these tracks are clear, the opposite ones being loaded. Although designed as a pure thrust unit, it may be used for combined loadings, but in this case, the axial loads must always be at least twice the journal, or else there is a danger of the ball contacting the tracks at more than the requisite two points. Thus it would be induced to spin instead of rolling, so causing a premature failure. To allow the clearance on the tracks as described, it is obviously necessary for the bearing to have ample internal slackness. The bearing should, therefore, only be applied to those reversing thrust applications where this movement is not detrimental.

In common with all ball journal-bearings, used as pure thrust units, the "duplex" bearing should be mounted with the outside diameter clear in the housing, and if shaft support or journal load reaction is required at this point, a roller-bearing can be introduced to perform these duties. Where no end movement is permissible, a bearing as shown at Fig. 8 is very often used. It is known as the double-row double-purpose bearing and is, in effect, two angular contact bearings mounted face to face, the important difference being the common inner ring. It is normally supplied with a slight amount of preload. As will be noted from the diagram, the outer ring which reacts to the major thrust load is clear in the housing. The illustration actually shows an automobile bevel pinion mounting. The right-hand row of balls deals with the thrust from the gears with the car running in the forward direction, the journal load being shared by the left-hand row of balls, and the small roller-bearing. When the car is being reversed, the left-hand row is also required to deal with the thrust as well as the journal load, but as this is usually of short duration only, it is not detrimental.

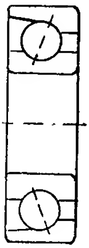


Fig. 6

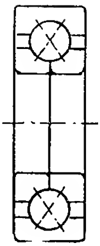


Fig. 7

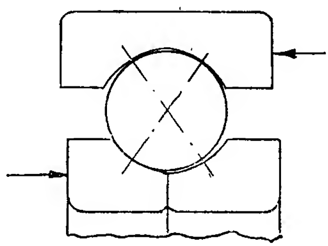


Fig. 7A

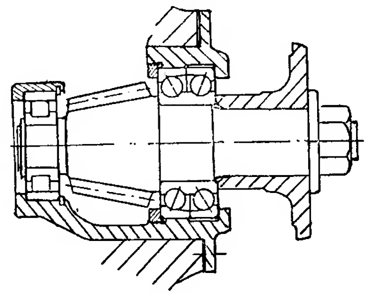


Fig. 8

Making Union Nuts

I DON'T know whether the following idea has been put forward before, but I found it to be as easy, if not more easy, than the "official" method of making union nuts. The reason for trying the idea was that whilst making some nuts for "L.B.S.C." locomotive, "Petrolea," I had the misfortune to break my plug tap of the size required; as it was the week-end, I was unable to obtain another, and, of course, I did not like the idea of wasting, what is to the model engineer one of his most precious possessions, "Spare Time," so I began to study what could be done, and the following was the result.

Part off the required length of hexagon rod, less $\frac{1}{16}$ in., and mount this piece in the three-jaw chuck. Drill the necessary tapping size *right through*, and tap. Remove from chuck and silver-solder to one end a $\frac{1}{16}$-in. piece of brass. Put back in the chuck and turn the soldered end, first with the round-nose tool, and then, when nearly trimmed down to the hexagon, finish with a file, and at the same time chamfer the edge. All that remains to be done now is to drill this end with the required clearance drill for the size of pipe being used; reverse in chuck and chamfer the other end.

Whilst this method is slightly unorthodox, it saved me valuable time, and I had a finished article quite as good as one made by the recognised method; at the same time, I had a perfect thread in the nut without the use of a plug tap.

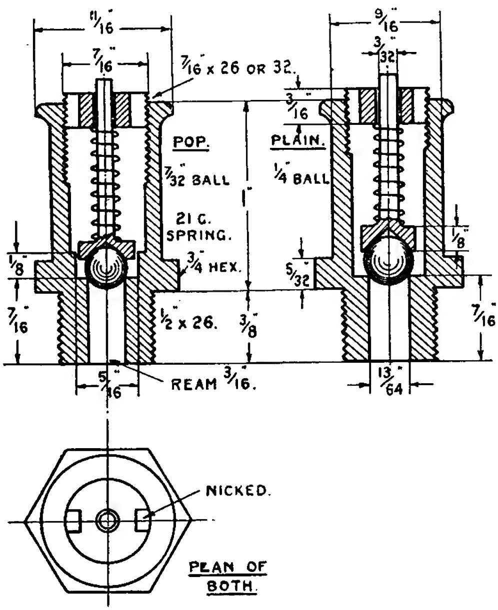
Since I first tried the idea, I have made several more by the same method, and as stated, can make them as quickly as I did in the recognised manner.—J. TURNER.

SAFETY - VALVES

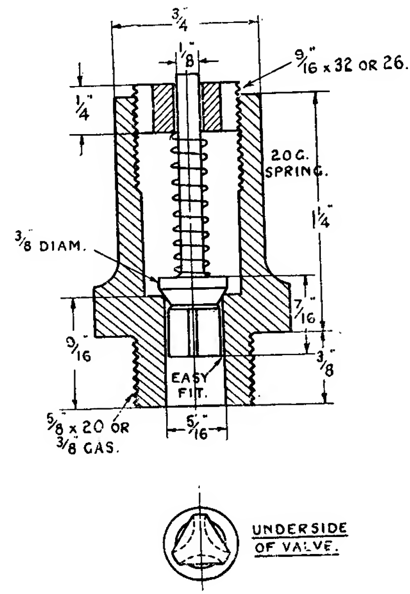
for "Doris," "Minx" and "Maid of Kent"

by "L.B.S.C."

IT will save time if I deal with the safety-valves of all three engines at once, so here is the "how-do." The full-sized "L1's" are furnished with a pair of 2½-in. Ross pop safety-valves set to blow at 180 lb., and I have received requests from several builders of the "Maid," to describe how to reproduce these in a suitable size for the got the full benefit of it in my face and down my neck, and I prefer to take a "shower" in the bathroom! For beginners who may be puzzled as to why this comes about, I'll briefly repeat that the sudden opening of the valve causes a reduction in pressure on the surface of the water right under it. Immediately, up jumps a minia-



Safety-valves for "Maid of Kent"

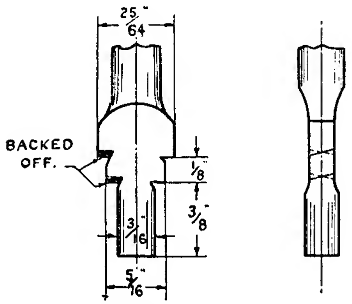


Safety-valve for "Minx"

little engine. Here is one instance where we cannot "scale down," as the little valves would only be $\frac{5}{16}$ in. diameter outside the casing, and the valves themselves would be too weeny to let sufficient steam pass, to relieve the pressure if the regulator should suddenly be shut whilst the engine was running at a good clip, with a tidy load and a good fire. To be absolutely on the safe side, it will be necessary to use a valve with a 7/32-in. ball on a $\frac{3}{16}$-in. seating; and to get that in, will require a column or casing $\frac{9}{16}$ in. diameter. May I repeat for beginners' benefit, I don't personally care for pop safety-valves on little engines; I fitted several to my own engines, but have taken them all off except those on "Annabel," the 2-6-6-4 Mallet. All my boilers are good steamers, and the valves will often start to blow off when running, as the few good folk who have seen my little railway in operation, can testify. The sudden rush of steam lifted the water; I ture waterspout, which will reach the bottom of the valve if there is a full glass at the time, and out goes some of it with the steam. At the same time, the rush of the steam skims drops off the sides of the "hill of water," as it blows from the valves, and they go out as well. Once the action is started, it keeps on until the valve closes, and it will empty the gauge glass in a very short time. I have actually witnessed the above taking place, as I fixed up a fireproof glass laboratory gadget like a flat-bottomed boiler, with a pop safety-valve, and got up steam in it over a Primus stove. Seeing is believing!

Incidentally, the above is one of the reasons why pop safety-valves are not used on the taper boiler barrels of G.W.R. engines; they would be too close to normal water-level. The first Stanier 2-6-0's on the L.M.S. had pop safety-valves on the firebox, and they also had the G.W.R. steam-collecting arrangement of two open pipes in the

front corners of the Belpaire wrapper. Whenever the boiler blew off hard, the water was lifted, and went down the steam pipes. That was why a dome on the barrel was substituted for the G.W.R. arrangement; it was the only way to stop the priming. Reverting to the "Maid of Kent," here are the details of the pop safety-valves as requested, along with a plain valve of similar shape and size. Fit which you prefer,



Double pin-drill for pop safety-valves

but don't blame me if you get a wetting from a pop-valve now and again!

Special Pin-drill

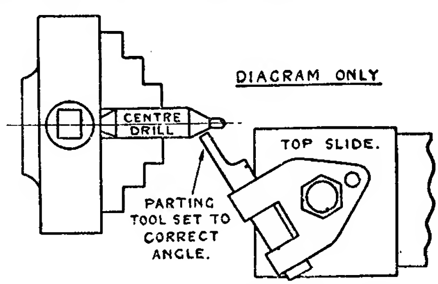
The first item required will be a special pin-drill with two different-diameter cutting edges, to form the valve seating and the pop recess in the column, at one fell swoop. It is easy enough to make. Get a piece of 7/16-in. round silver-steel about 4 in. long. Chuck in three-jaw, face the end, and turn down 3/8 in. length to a bare 3/16 in. diameter. Drill a 3/16-in. hole in any odd bit of metal, and use it for a gauge; when the turned bit of the rod fits the hole easily, it is O.K. for size. Now turn 1/8 in. length to 5/16 in. diameter; use a knife-tool with the point well backed off, so that you can undercut slightly at the shoulder, as shown in the illustration. Turn the next 3/8 in. or so, to 25/64 in. diameter; the rest of the rod can then be reduced to anything below that diameter. If you like, you can reverse the process, turning down the top part first, then reversing in the chuck, and turning the business end, as above.

Next, file the piece of metal flat, right across the 5/16-in. and 25/64-in. parts, as shown in the side view, leaving the 3/16-in. part round, as it forms the pilot pin. Watch your step on the next job; it isn't difficult, merely requires care. With a weeny three-cornered file, such as clock-makers use, back off the cutting edges, as shown in the illustration; file right up to the cutting edge, but take care not to destroy the cutting edge itself. When that job is done, make the whole of the end red-hot, and plunge vertically into clean, cold water. Touch the flat part on your emery-wheel, or else wrap a piece of emery-cloth around a flat stick, and brighten up the flat part with that, taking care not to dull the cutting edges. Then lay the pin-drill on a piece of sheet iron or steel, and hold it over the domestic gas stove, or over a bunsen flame. As soon as the bright part turns yellow, tip it off into the cold water. Finally, brighten up the 3/16-in. pin, make the kitchen poker red-hot, and hold it against the pin until it turns blue, then quench out. The pin-drill is then ready for use, unless you have accidentally filed or otherwise dulled the cutting edges, in which case another application of the emery-wheel is called for.

Valve Body

The externals of both pop and plain valves are the same. Either 3/4-in. hexagon rod, bronze for preference, or a gunmetal casting can be used. Chuck in three-jaw, face the end, turn down 3/8 in. length to 1/2 in. diameter, and screw 1/2 in. by 26. If rod material is used, part off 1 in. from shoulder. Re-chuck in a tapped bush held in the three-jaw; this is made as mentioned in the note about snifting-valves. Centre the end; and for the pop safety-valve drill right through with No. 14 drill. Open out with 25/64-in. drill to a depth of about 5/8 in. Put a 3/16-in. parallel reamer through the remains of the No. 14 hole, then put your "patent" pin-drill in the tailstock chuck, and carefully feed it in until the leading cutting edge (the 5/16 in. one) has penetrated to a depth of 15/16 in. The method I use for depth-gauging on jobs like this, is precisely the same as I use on injector-cone reamers, viz. a little brass collar, with a set-screw, on the spindle. If you set this at a distance of 15/16 in. from the leading cutting edge of the two-step pin-drill, the veriest Billy Muggins among beginners couldn't "over-shoot the platform." Tap the upper part of the pin-drilled hole 7/16 in. by 26 or 32, and make a little nipple to fit it. This is merely a bit of 7/16-in. round rod, chucked in three-jaw and screwed to match the valve. Face, centre, drill down about 1/4 in. with No. 40 drill, part off a 3/16-in. slice, and file two nicks in it to let the steam out, as shown in the plan view. The outside of the valve is turned to the outline shown, and needs no detailing out.

In case any beginner doesn't know why the valve opens with a sudden pop, and shuts down



How to set tool for turning valve cone

again with the same alacrity, I will explain in a few words, to save direct correspondence. As soon as blowing-off pressure is reached, steam lifts the ball and enters the recess under the "doings" which holds the ball down. As this is of much larger diameter than the ball seat, and it fits in the recess almost like a piston in a cylinder, the same pressure of steam which was only just sufficient to lift the ball off the seating, is enough

to blow the "piston" clean out of the end of the "cylinder," entirely releasing the ball, and allowing the steam to escape with a sudden rush. As soon as the pressure has fallen 3 or 4 lb. below blowing-off point, the spring, aided by a small amount of back-pressure in the column, promptly takes command and plonks the ball back on the seating. That isn't exactly a "scientific" explanation—it isn't intended to be!—but it always seemed to your humble servant that the lingo of the running-shed and footplate is far more understandable than any text-book, and that is why I use it.

To get the correct size of the "piston," cup, or upper valve, whichever you like to call it, a dummy valve-seating will be needed; and this is made in a couple of minutes with the two-step pin-drill. Chuck a piece of round brass rod (any odd scrap will do, $\frac{7}{16}$ in. diameter or over, and about $\frac{1}{2}$ in. long), face, centre, drill through with $\frac{3}{16}$-in. drill, and then open it out with the pin-drill until the first step has fully entered, and the wider step has just started to scrape the end of the stub of brass rod. Now chuck a piece of $\frac{3}{8}$-in. round brass rod in the three-jaw, and turn down about $\frac{7}{8}$ in. of it to 3/32 in. diameter; incidentally, I never have any trouble in turning fairly long thin spindles in the chuck without support, as I use a knife-tool with plenty of top rake ("against the book" again!) and the point very slightly rounded; but high speed is essential. Turn the next $\frac{3}{16}$ in. or so to a full $\frac{5}{16}$ in. diameter, just too big to enter the recess in the dummy seating. Part off $\frac{1}{8}$ in. from the shoulder. Reverse in chuck, and grip by the thin spindle, having the blob at the end fairly close to the chuck jaws; then turn it until it is an easy fit in the recess, using the dummy seating itself as a gauge.

Make a mark in the centre, with a centre-drill; don't put this in farther than $\frac{1}{16}$ in., or you'll cut into the spindle; then form a countersink with a 7/32-in. drill in the tailstock holder. Now put a 7/32-in. ball—a cycle-ball will do fine for this part of the proceedings—on the seat in the dummy, and give it a crack with a hammer, so that it occupies the same position the valve ball does in the real valve. Try the countersunk disc on it; when the countersink is hard down on the ball, the edge of the disc, upper valve, or "jazz-cup" as I usually call it, should enter the recess in the dummy, a full 1/32 in. If it doesn't, deepen the countersink until it does. If it enters a little more, it doesn't matter a bean.

Drop a 7/32-in. rustless steel ball into the column of the proper valve, seat it same as you did the pump valves, and assemble the lot as shown in the sectional illustration. The spring should be wound up around a piece of $\frac{1}{8}$-in. round silver-steel; I have described many times how to make them. Use 21-gauge tinned steel wire; this will last a long time before requiring renewal, as it does not rust easily, owing to the tin coating.

How to Test and Adjust the Valves

For testing and adjustment I use a small air reservoir that will stand boiler pressure. One can easily be rigged up from an odd bit of brass or copper tube, 16- or 18-gauge, and any diameter from 2 in. up to 4 in. or so. A 16-gauge disc can be soldered into each end; and above $2\frac{1}{2}$ in. diameter, a stay will be needed through the middle. My own gadget is used horizontally, and is silver-soldered throughout, as it has done a lot of testing; but one made up about the size of a condensed-milk can, is a convenient one for all the testing the average home locomotive builder would need. Three or four tapped bushes of different sizes are soldered into the top, also a union fitting like the adaptors used for testing the boiler; the pressure-gauge you used for that job, will come in mighty handy for this. Another similar union is needed, to which a tyre-pump is connected; and lastly, a cock, or simple screw-down valve like the air release on a Primus stove, or a blowlamp. The diagram shows the rig-up.

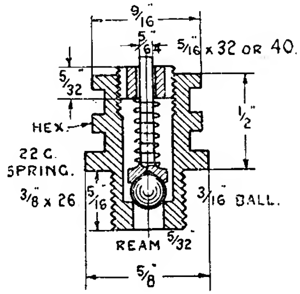
Screw your pop safety-valve into the appropriate bush, and plug the unused ones. Tighten the nipple at the top of the valve, pump air into the tank until the gauge registers 80 lb. and then slacken the valve nipple until the valve pops off. On such a small air tank, it should just give one hearty pop and shut down immediately, the hand on the gauge just giving a flick. If, however, it lets too much air out, and doesn't shut down until the pressure has fallen from 10 to 20 lb. or so, the disc is too close a fit in the recess. Take it out, chuck in three-jaw by the spindle, and take just the weeniest skim off the edge of the cup, say a thousandth or so; then try again. If still releasing too much air, repeat process, and keep on until you get the single pop with a barely noticeable reduction of pressure. That is all there is to it. You can fit the valves to the "Maid's" boiler, and needn't trouble about looking at the steam-gauge; the valves will keep you well informed—but don't have the water-level too high, otherwise you'll finish the run with a wet shirt!

Plain Valve

The body part of the non-pop valve is made the same way as the pop-valve, and is turned externally to the same outline; but instead of reaming $\frac{3}{16}$ in., use a drill that size, and ream 13/64 in. If you have not the odd-sized reamer, don't worry, finish off with a 13/64-in. drill. The stepped pin-drill is not required; finish the hole to $\frac{11}{16}$ in. depth with a $\frac{3}{8}$-in. D-bit. The upper end of the hole is opened out with a 25/64-in. drill, tapped $\frac{7}{16}$ in. by 26 or 32, and furnished with a nipple, same size as that on the pop-valve.

The cup and spindle is made exactly the same as for the pop-valve, but the cup is made 9/32 in. diameter, and countersunk with $\frac{1}{4}$-in. drill. If the 13/64-in. hole at the bottom of the valve has been drilled instead of reamed, it would be advisable to true up the ball seating, and this is easily done by putting a big taper broach down the hole, entering it from the top of the column, and just taking out a scrape. Don't be violent with the broach, or you'll make the end of the hole too big to suit the diameter of the ball, and the valve will be everlastingly dribbling, instead of shutting down steam-tight. Seat a $\frac{1}{4}$-in. rustless steel ball on the hole, same way as before, and assemble as shown. The valve can be tested, and set to blow at 80 lb. pressure, on the testing

gadget referred to above. Screw the nipple down fairly tight, pump up the air tank to the desired pressure, and then slack back the nipple until the valve just commences to sizzle. Beginners note—the fit of the nipples in the valves must not on any account be slack; they should be a little on the tight side if anything, otherwise the adjustment will alter whilst the engine is running, and the valves will blow off much too early. I have seen the nipple on a pop safety-valve work clean



Safety-valve for "Doris"

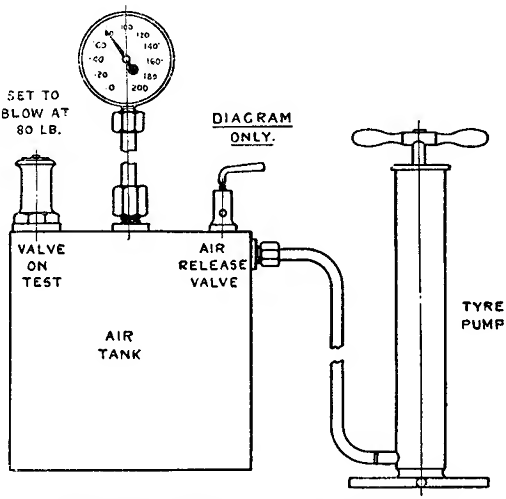
out, and disappear in company with the cup and spindle, ball and spring, and the boiler empty itself through the valve column, all because the nipple was a sloppy fit; or rather, I should say, a non-fit!

Safety-valve for the "Minx"

As this lady has only one safety-valve, in an ornamental oval casing, it must be big enough to relieve the pressure "all on its own," as the kiddies would say. The illustration gives a section of it. The valve could, of course, be made on the same principle as the plain type of valve for the "Maid," as described above; but by the time you have put a $\frac{3}{8}$-in. ball in the column, and a big cup to match there isn't much room left for a decent spring, so I have substituted a wing valve of the proper type.

The body of the valve is made the same way as the "Maid's" valves, only larger; a piece of 1-in. hexagon bronze or gunmetal rod can be used, but our advertisers will probably supply a casting, as they will also cast the casing to match. Anyway, either rod or casting is chucked in three-jaw, the end turned and screwed either $\frac{5}{8}$ in. by 20, or $\frac{3}{8}$ in. gas thread, to match the boiler bush, and then re-chucked in a tapped bush, and the column turned, bored and reamed as previously described, but to the sizes given in the sectional illustration. The edge of the $\frac{5}{16}$-in. reamed hole at the base of the valve body must be slightly countersunk, to form a proper seating for the valve itself, and this is easily done; after D-bitting to $\frac{1}{2}$ in. diameter and $1\frac{1}{16}$ in. depth, put a big centre-drill in the tailstock chuck (size "F" or "G" would do, the bodies of both being $\frac{7}{16}$ in. diameter) and give the edge of the hole just a touch with it. Just that and no more; the seating need be no more than 1/32 in. wide.

To make the valve, chuck a bit of $\frac{7}{16}$-in. round bronze rod in the three-jaw; don't use brass this time, as the valve is formed on the end of the spindle and needs a good grade of metal, a different thing altogether to a "jazz-cup"! Turn the spindle as described previously, but to $\frac{1}{8}$ in. diameter and $1\frac{1}{8}$ in. length. Turn the next $\frac{1}{2}$ in. length to 13/32 in. diameter, and part off at $\frac{7}{16}$ in. from the shoulder. Reverse in chuck, holding by the spindle, with the boss as close to the jaws as possible. Turn down 9/32 in. of the boss to an easy fit in the $\frac{5}{16}$-in. hole in the bottom of the valve column, using same as a gauge. Undercut the shoulder, as shown in the sectional illustration; then form a cone directly above it. There are several ways of doing this; if your top slide has a graduated base, set it over to 30 deg. and use a knife-tool with the sharp point just taken off on an oilstone. A square-nose tool with one corner ground off to the same angle, would also do it; but there is a "stone-ginger way," as we used to say at school, for a beginner with a cheap lathe *sans* graduated slide-rest. Put a centre-drill in the three-jaw; preferably the same merchant that was used to countersink the seating. Put a fairly wide parting-tool in the slide-rest tool-holder, run the rest up to the centre-drill, and adjust the cutting edge to the taper on the centre-drill. Tighten the clamp; re-chuck the valve, run the tool (now set at correct angle) up to the part to be turned taper, and *pull the belt by hand* as you carefully feed the tool into cut. If you try to form the cone at the usual turning speed, it will chatter like—well, I know what these cheap, flimsy lathes are!—but by pulling the belt by hand, and applying a drop of cutting-oil, you



Rig-up for testing and setting safety-valves

will get a perfect cone. Young Curly learned that trick for himself, half-a-century ago.

Either file three flats on the bottom part of the valve, as shown in the underside view, or if you have a milling-spindle for the lathe, mill out recesses as shown by the dotted lines, forming three wings. Incidentally, these milling and drilling spindles seem to have gone clean "out of fashion," yet they are most useful, and easily

(*Continued on page* 140)

AN INDEX-MARKING APPLIANCE

by J. O. S. Miller

FROM time to time, most model engineers make some lathe or milling attachment requiring a graduated collar on a feedscrew, or a base graduated in degrees. As only light cuts of a few thousandths deep are necessary on work of this kind, it becomes rather tedious and cumbersome to use the lathe saddle or slide-rest. To meet the need for something to speed up this sort of work, the tool described was made up.

In effect, it is a tiny shaper with a relieving cutter. The revolving and indexing stop-piece (with spring-loaded ball) ensures three different stations and lengths of lines on the work, according to the setting of the adjusting screws. In my case the tool was designed and made to fit the tool-post of a $4\frac{1}{2}$-in. "Hamson" lathe, but could be altered to suit any lathe. As illustrated, it is set for use on work held in the lathe chuck or between centres. For making graduations "on the flat," similar to those on a protractor and some lathe cross-slides, the ram is removed and reinserted when the body part has been turned end for end. Hence the extra fixed stop at 60 deg. The $\frac{7}{16}$-in. step on the spindle has, of course, three holes or dimples at 120 deg. so that the spring-loaded ball in the revolving stop-piece will ensure that the stops come into line each time.

The body part is welded up to suit the size of lathe and tool-post, and drilled, bored and reamed while held in its working position, to ensure that the tool will always be on centre height.

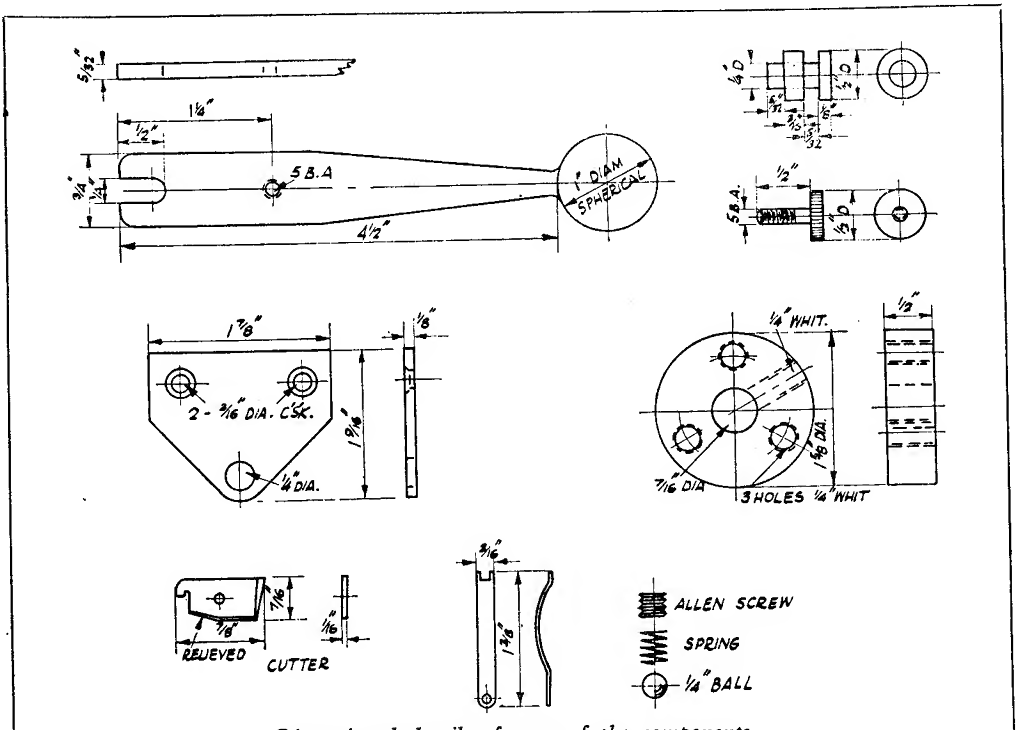
The spindle or ram is of silver-steel and must be a good sliding fit in the body part. The lever must also be a good fit in the slot and between the cheeks of the fulcrum-pin.

The spring-loaded cutter (from H.S.S. power hacksaw blade) relieves on the return stroke and fits its milled slot without shake.

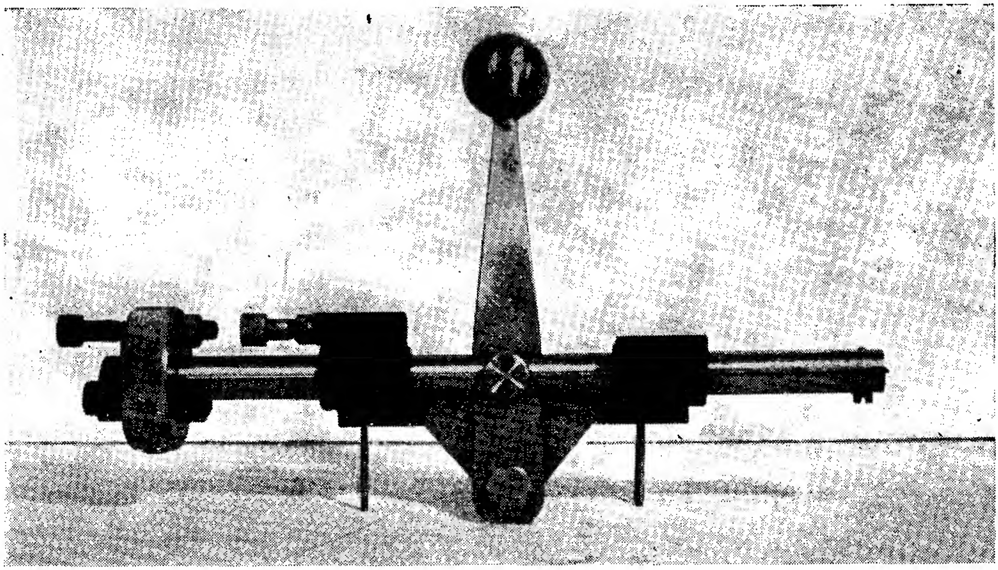
It will readily be appreciated that any shake or play in the parts mentioned would prevent accurate work.

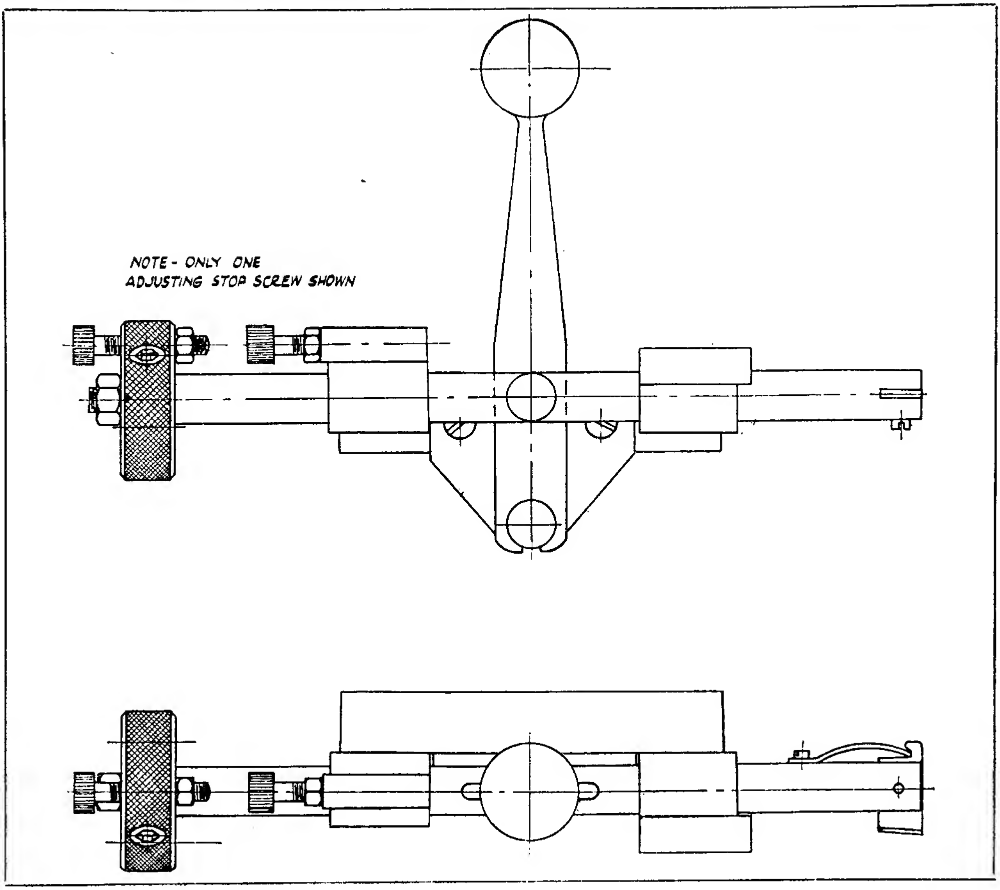
To those in need of such a tool, I present the idea, although, like most things, it could be improved upon.

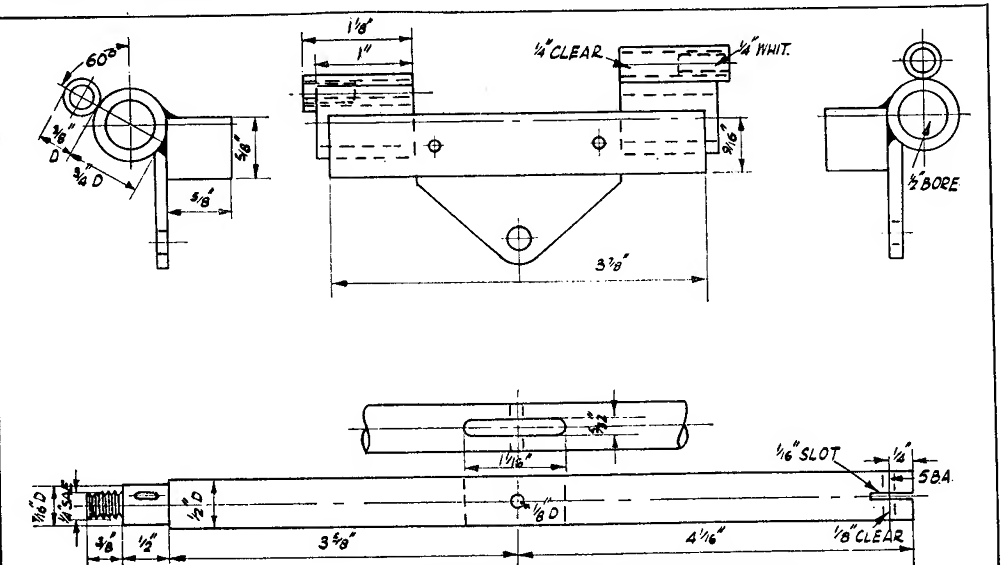
In my case, it has proved well worth the trouble of making and has already made light work of a number of jobs that would otherwise have become tedious.



Dimensioned details of some of the components




NOTE - ONLY ONE
ADJUSTING STOP SCREW SHOWN



Details of the body and spindle for the index-marking appliance

"L.B.S.C."

(*Continued from page* 137)

home-made. A simple spindle, running through a square bit of bar which can be clamped under the slide-rest tool-holder, with a pulley at the back end and a small drill chuck at the front end, can be rigged up and driven from a small overhead shaft, in turn driven from the same motor, or pedal-wheel, used to drive the lathe itself. A small end-mill, or home-made slot-drill, put in the drill-chuck and fed up to the valve whilst still in the three-jaw, would mill out the radii and form a proper wing-valve, almost as quickly as I can write these words. I have a similar gadget, which fits my type "R" Milnes lathe, but seldom use it, as I have the regular vertical and horizontal milling machines.

Make a nipple, same as for the smaller valves, to suit the bigger one, drilling it No. 30. Put a smear of grinding paste (a scrape off your oilstone does fine) on the valve cone, insert it in the column, put the nipple in, and twirl it back and forth a few times. Wash off all traces of the grit with paraffin, then assemble as shown, using a spring made from 20-gauge wire wound around a bit of 5/32-in. rod; set to blow at 80 lb. as before, and that's that!

Safety-valves for "Doris"

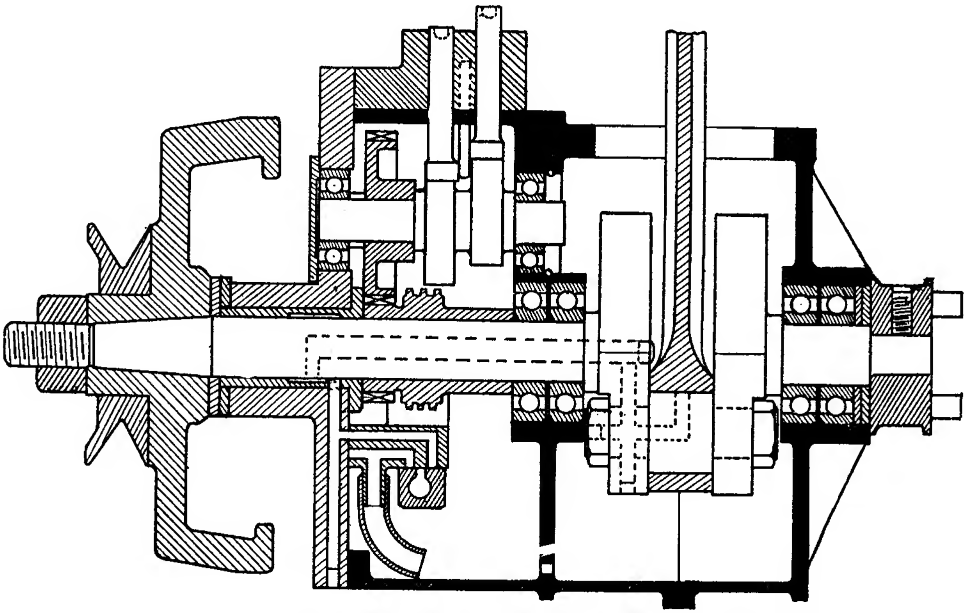
It won't be necessary to detail out the making of the safety-valves for "Doris," because they are virtually the same as the plain type already described for the "Maid," but smaller. There is, however, one difference. Owing to the low height (says Pat) of the valves, the ball seating is set right down in the screwed portion, which allows of an adequate length of spring being fitted. The bodies are made from $\frac{5}{8}$-in. round bronze or gunmetal rod, the screwed portion being $\frac{5}{16}$ in. long, $\frac{3}{8}$ in. diameter, and screwed $\frac{3}{8}$ in. by 26 to suit the boiler bushes. Part off at $\frac{1}{2}$ in. from the shoulder, re-chuck in a tapped bush, and form the body with a parting-tool, leaving a flange in the middle, and another at top and bottom. Reduce the top one to $\frac{9}{16}$ in. diameter, and file the middle one hexagon shape. This is easily done whilst still in the chuck, using the chuck jaws as guides; file a flat with each jaw vertical, at the top of the chuck, then three more with each jaw at the bottom, holding the file horizontally. Drill the body No. 24, open out with 9/32-in. drill, and D-bit it to $\frac{11}{16}$ in. depth. Ream the remains of the 24 hole with 5/32-in. parallel reamer; tap the top $\frac{5}{16}$ in. by 32 or 40, make a nipple to suit, seat a $\frac{3}{16}$-in. ball on the hole, and fit a cup and spindle as shown. The spring is wound up from 22-gauge tinned steel wire, over a 3/32-in. rod, and the valve is set to blow at 80 lb. as before. Should any of these plain valves fail to shut down tightly, but persistently dribble, the ball and seating being O.K., the cause will be the spring bearing unevenly on both the cup and the nipple. If the ends of the springs are ground flat by touching them on the side of a fast-running emery-wheel—and mind your fingers whilst doing it, also recollect that steel becomes hot whilst being ground!—they will take a fair bearing on both cups and nipples, and press the ball squarely on the seat, preventing any dribble. Next stage, decorations for the backheads.

B.H.P. Tests on Petrol Engines

by R. E. Mitchell

AT the end of my article published in THE MODEL ENGINEER, October 16th and 23rd, 1947, it was stated that crankcase and crankshaft had been redesigned.

The main reason for this being necessary was due to the early failure of one of the main bearing bushes. The one in question being the heavier loaded bearing adjacent to the crank disc. Although it had been prepared from cast phosphor bronze specially supplied for bearing bushes, wear was very rapid, and after being renewed twice, together with one renewal of the bush at the flywheel end, the crankshaft showed a reduction of 0.002 in. in diameter. Further renewals were considered to be unsatisfactory without the preparation of a new crankshaft. A thorough examination of the other bearings in the engine revealed them to be in excellent condition, and it was particularly gratifying to find that the big-end bearing, which consisted of an unbushed duralumin connecting-rod running on a hardened steel crankpin, showed no detectable wear. One remedy for the severe crankshaft bearing wear would be to lengthen the bushes together with a longer crankshaft. This was decided against and the full two-bearing crankshaft design was favoured. Since a split big-end connecting-rod is objected to owing to an early failure of this type of construction, a built-up crankshaft was the only alternative. A full crank and unsplit big-end bearing would also make a divided crankcase a necessity. Although the lubrication system appeared to lubricate the big-end satisfactorily, it was rather a nuisance in that the timing case had to be drained of oil after every boating session because if left for any length of time, the oil drained into the crankcase and resulted in severe over-oiling when starting up again. The best way of overcoming this difficulty would be to fit a mechanical oil pump and a sump to act as oil reservoir. It was also decided to reduce mechanical friction and oil drag to a minimum and so increase the mechanical efficiency. This could be effected by using ball-bearings where possible together with ensuring that a minimum of piston area is in contact with the cylinder wall. It is stated that piston friction accounts for about 75 to 85 per cent. of the total friction loss. From this it will be seen that the only parts which could readily be retained are the cylinder and cylinder-head which have behaved perfectly. Previously, coil and battery ignition had been used and while this system gave every satisfaction, the upkeep of small accumulators is a nuisance. Consequently, to avoid this difficulty, magneto ignition was



Section of the redesigned engine. The cylinder and cylinder-head are omitted, being described in an earlier article

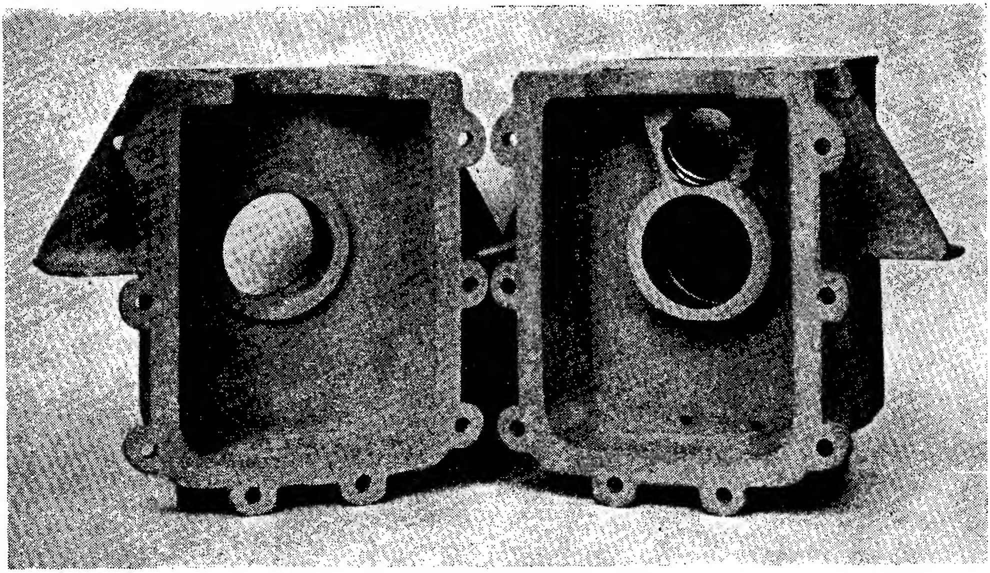


Fig. 1. Inside of finished crankcase

considered advisable. Since a separate magneto was favoured a drive must be provided at each end of the crankshaft, at the forward end for the magneto and at the flywheel end for the propeller shaft. Ball- or roller-bearings were out of the question for the big-end bearing owing to their large size and doubtful advantage in this situation. Although ball-races could be provided for the main journals a plain bearing must be provided for the admission of oil to the crankshaft and then to the crankpin. Consequently a three-bearing crankshaft was decided upon, using ball-races adjacent to the crank discs, and a plain bush, which would be very lightly loaded next to the flywheel. The ball-races obtained for the crankshaft were Hoffmann U.S.3 and it was decided to use two on each side of the crank discs. It is realised that the self-aligning proper-

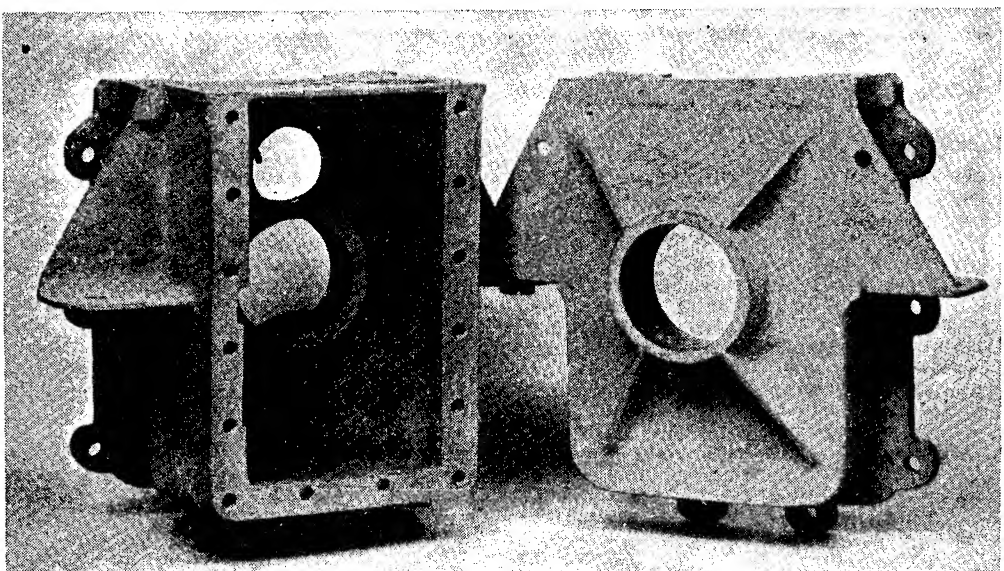


Fig. 2. Inside view of timing case and front end of crankcase

ties of these bearings is unnecessary; and if two are placed together in the same housing this property is lost. Actually they were the only ones available at the time.

The crankcase was again fabricated by brazing from 16-gauge mild-steel sheet, except the seating for the cylinder which is ¼ in. thick, together with the support for the main bearing and inner camshaft bearing, although the main partition between the crankcase and timing case is 16-gauge. The section of the crankcase is rectangular and there is sufficient depth below the crank webs to allow for ½ in. depth of oil occupying a volume of 50-c.c. There are 23 separate parts, these being necessary to avoid complicated bending operations. The crankcase was made as one unit to be split later. The lugs provided to take the bolts to secure the two halves together were drilled and reamed ⅛ in. diameter. Good fitting bolts are essential since a spigot could not be formed on the mating faces with the limited equipment available. The crankcase was then split as carefully as possible using a small, fine-toothed saw. The two faces thus produced were filed and scraped to light-tight fit. The internal flange intended to carry the timing case cover was similarly flattened. The two halves were then bolted together using eight 5-B.A. bolts and mounted by the timing case flange on to the lathe faceplate. The bosses were then bored to take the crankshaft ball-races to a tight push fit.

Magnesium alloy was used for the preparation of the timing case cover and is secured to the flange by fourteen 6-B.A. studs. The crankcase was mounted on a mandrel by the main bearing bores and the timing case cover was bored to take the plain-bearing bush. It is intended that this plain bearing should also serve to give lateral location to the crankshaft between the timing pinion on the inside and the flywheel boss on the outside. Thus the main ball-races, which are free to slide in their housings, will be relieved of all thrust. The previously prepared bronze bush was pressed into the end cover and was reamed from the inside using bushes in the main bearing bores as a guide. The seating for the cylinder was bored by securing the erected crankcase to an angle-plate mounted on the faceplate and locating from the timing case cover flange. This ensured that the cylinder is at right-angles to the crankshaft without complicated setting up. The housings for the camshaft ball-races were bored in line using the machined recess for the cylinder as location from an angle-plate. It will be noted that a circular wire spring, fitting into a circumferential groove machined in the inner camshaft bearing housing, is used to secure endwise location of the camshaft.

(To be continued)

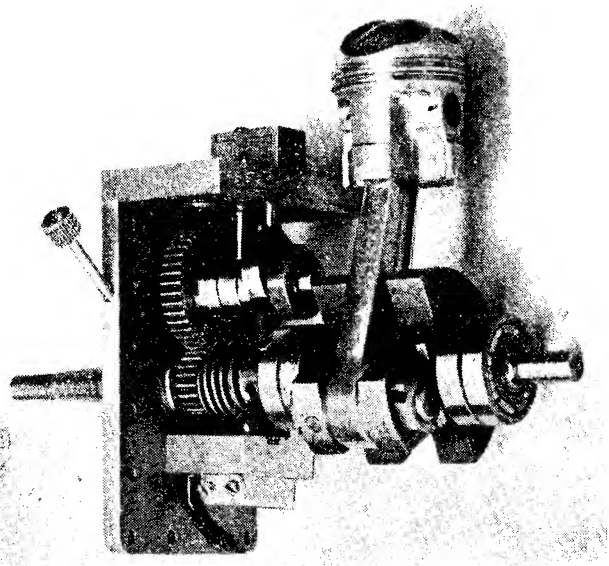


Fig. 4 (above). Crankshaft and camshaft assembly, showing the piston shape and rings

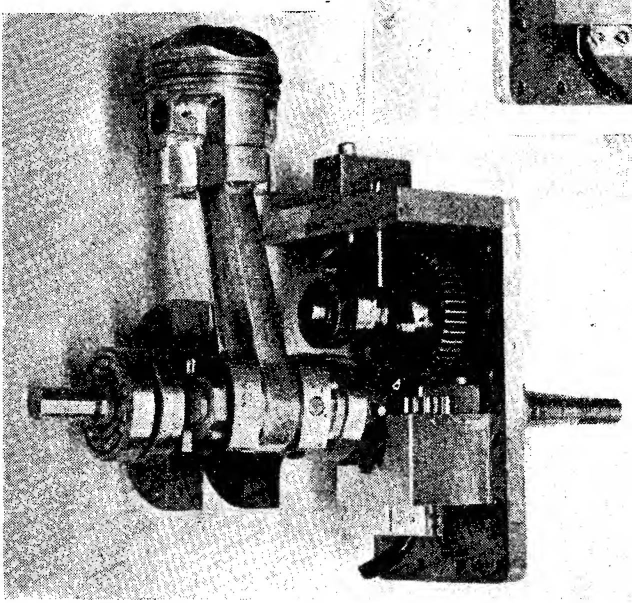


Fig. 3 (left). Crankshaft, piston, and camshaft assembly with oil pump

The Fareham Society's Second Show

A RATHER novel method was used by Mr. J. Alexander, Chairman of the Fareham Urban Council, when he declared open the recent exhibition staged by the Fareham Model Engineering Society, by pressing a button which set in motion a mechanical rower " manned " by a doll in sailor's attire.

In his opening remarks, Mr. Alexander described the Society as the " Baby of Fareham " which had grown very fast since its birth 18 months ago.

Com. F. J. Durnford (President of the Society) said their object was the encouragement of anyone who was at all interested in model making.

" Model making is craftsmanship, and I share with many others the regret that craftsmanship is losing its place in this modern age."

He visualised " enormous scope " for modellers in the future, and was glad that the Society had attracted so many young craftsmen.

The high standard of craftsmanship attained by the members of the Society was strikingly demonstrated at this show, many months of patient work being represented in the hundreds of exhibits which were on view in the Congregational Schoolroom, Fareham.

The display included models of ships, motor-boats, aircraft, locomotives, traction engines, and racing cars—many of them working. Mr. S. O. Chaplin was again to the fore with his fascinating collection of 250 aircraft models, which included almost every type of plane used during the late war.

Dominating the show was Mr. W. Canham's model Lancaster with its 10 ft. wing span ; it is capable of flight if powered by four motors, and the owner hopes to make it radio-controlled.

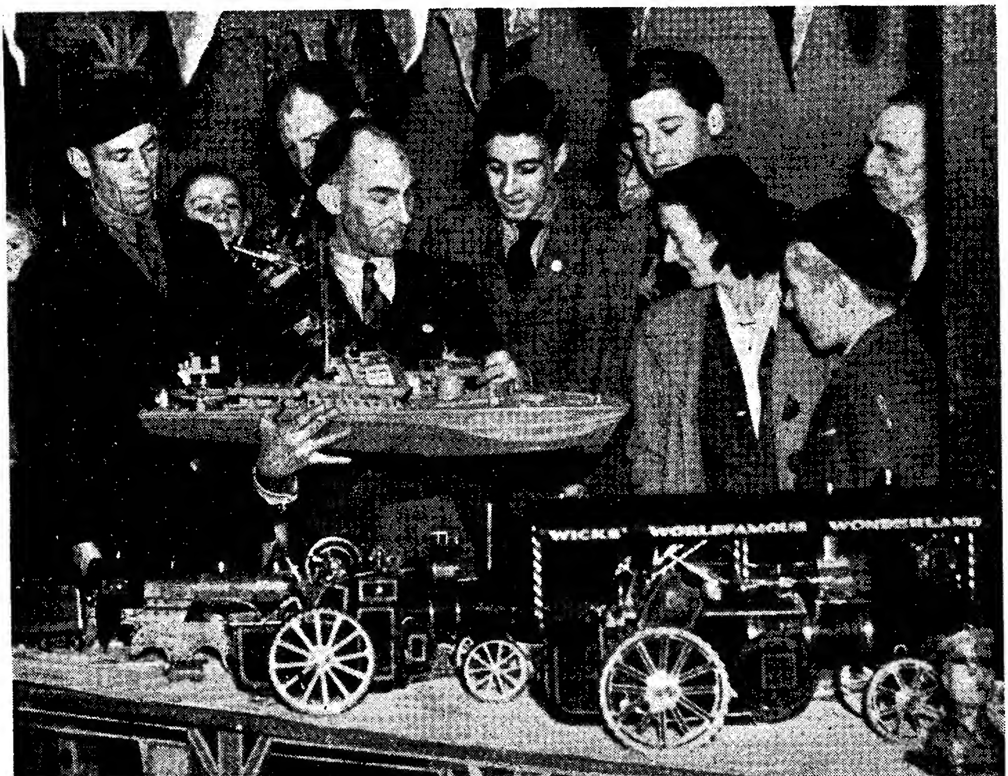


Photo by courtesy] [*The " Evening News and Hampshire Telegraph "*

Mr. A. May, the energetic secretary of the Fareham Society, explains the functions of details on one of the marine models to a mixed audience at the recent exhibition

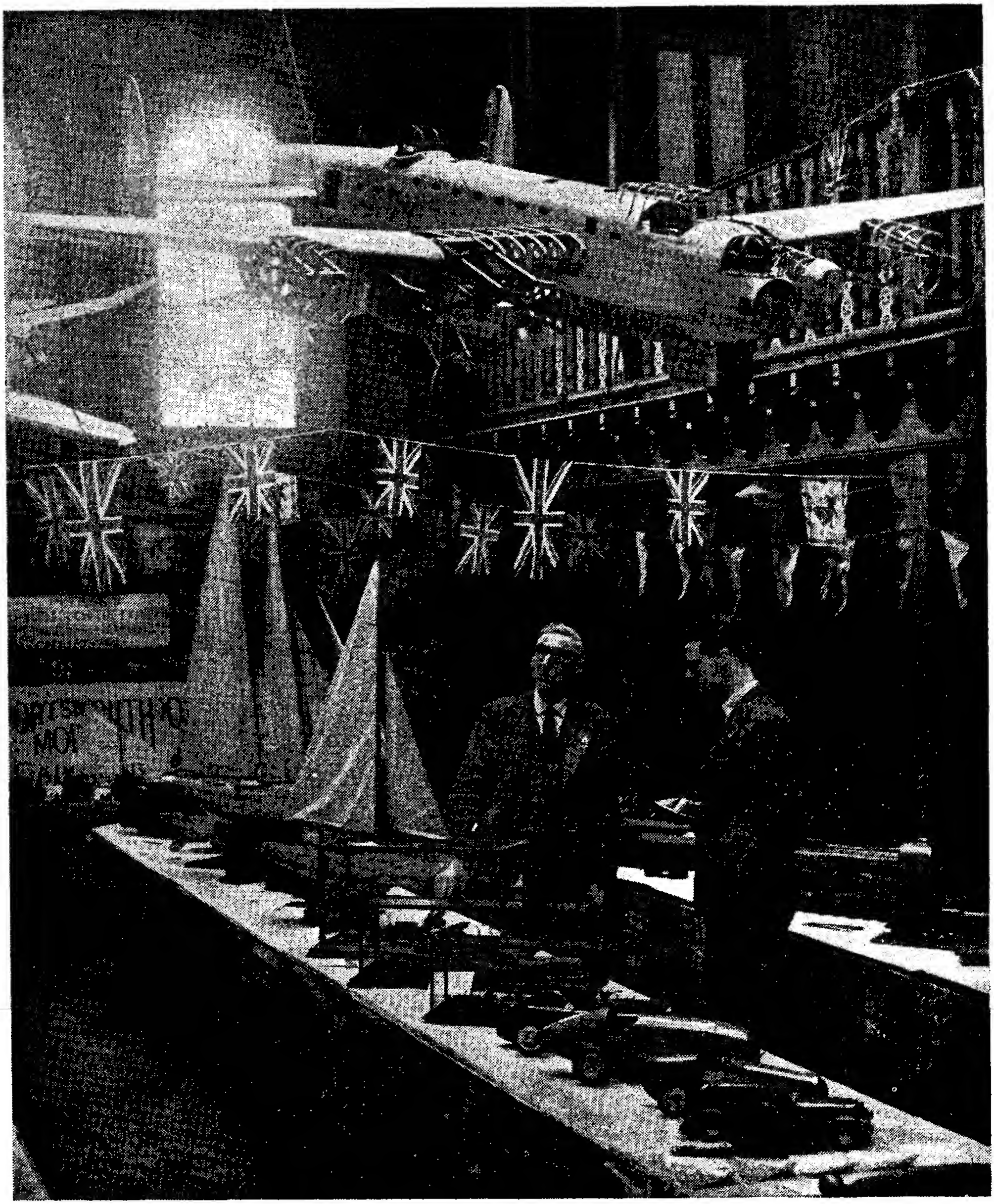


Photo by courtesy] *[The "Evening News and Hampshire Telegraph"*

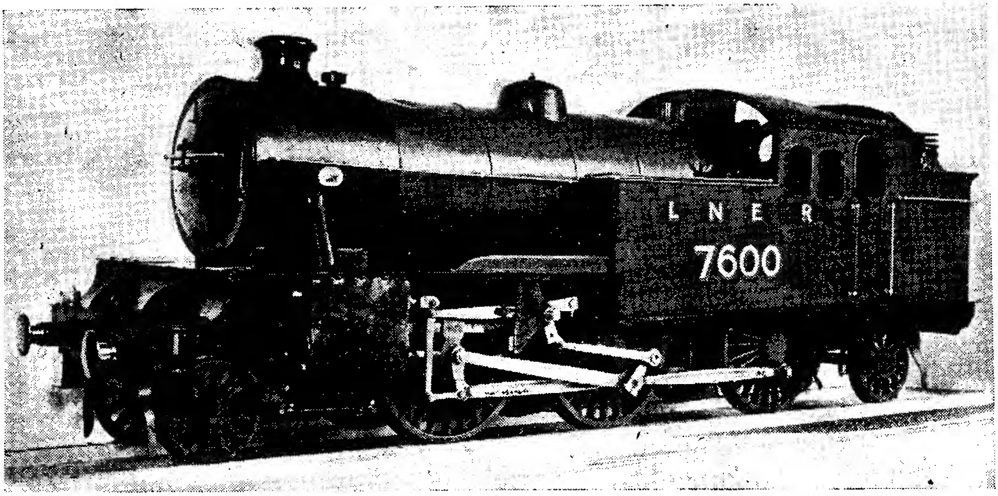
Photo showing the variety of exhibits on show at the Fareham exhibition, including the large-scale model Lancaster aircraft

Among the clubs who helped in the display was the Portsmouth Model Car Club, who had a special section which came in for a good deal of attention.

This second annual exhibition was arranged by the Society to augment the funds, and so enable them to obtain equipment for their future premises.

The Secretary informs us that the exhibition was a great success, and as a result, the Society has gained financially, and enrolled some valuable new members.

The success of this exhibition is rather remarkable, by the fact that it was staged during the Christmas shopping days, and when most people were otherwise engaged.—W.H.E.



A 5-in. Gauge L.N.E. 2-6-2 Tank Engine

by W. R. Thrower, M.D.

SOME locomotives suggest themselves as subjects for modelling because of special mechanical features, others because of their pleasing appearance. Both these considerations apply to the V1/3 express tank engines of the L.N.E.R. The 2-6-2 wheel arrangement either in tank or tender engines presents several advantages to modelmakers. For instance, the leading pony-truck can be of scale size and in its correct position without fouling the cylinders, a matter of importance in the restricted conditions of most garden railways, while the trailing wheels permit the use of a wide firebox for tender locomotives and provides a simple bunker support for others. The exacting operational demands nowadays on full-size passenger tank locomotives has necessitated the general adoption of a 4-wheeled trailing bogie to carry the large bunkers and tanks needed, but these demands do not apply to small locomotives ; in fact their coal and water consumption is quite out of proportion to full-sized practice. It was my original intention to use the side tanks of the model recently completed to carry water but apart from complexities of construction, it was obvious their limited capacity was likely to be of little use. When the side tanks were finally completed the rear sheets were omitted to provide convenient recesses for tools and, if necessary, extra coal on both sides of the footplate.

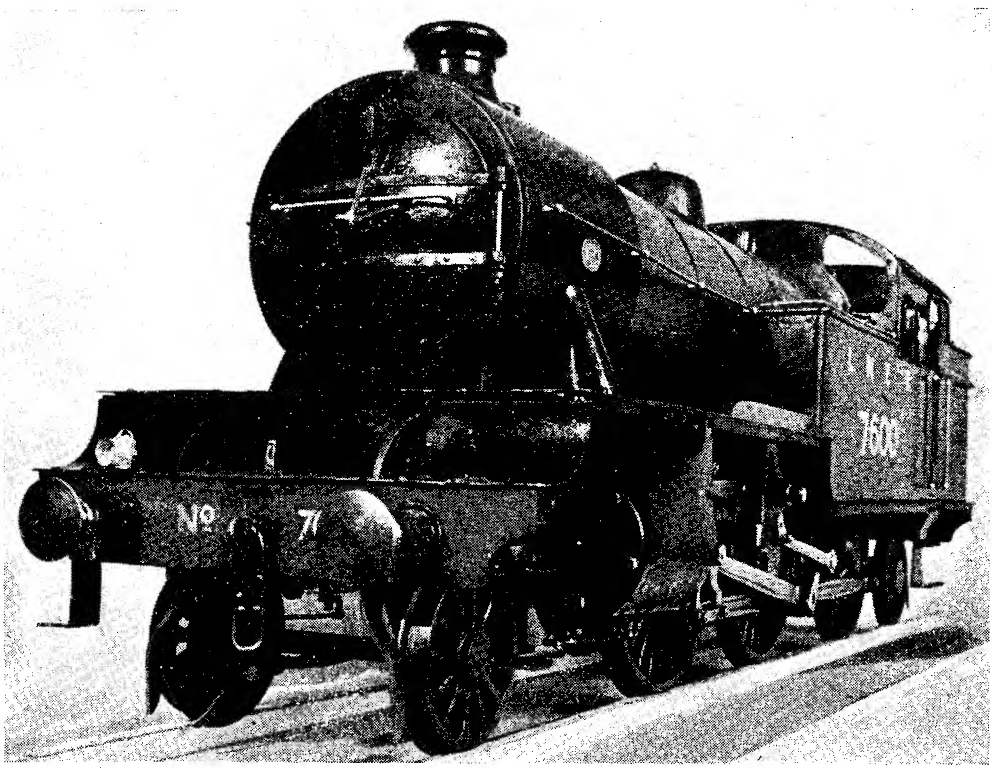
The 1-in. scale has much to recommend it. Locomotives and rolling stock are not so appreciably heavier than in $\frac{3}{4}$-in. scale that transport, when required, is not difficult, while their sturdiness makes building more straightforward than is possible in narrower gauges. An outstanding advantage is that ground level track can be used with passenger cars 10 in. wide which permits reasonably comfortable seating arrangements.

Most workers are agreed that the scaling down of full-size locomotive designs results in disappointing performance, but much can be done to preserve the characteristic features of a prototype. Working to 1-in. scale in 5-in. gauge is, however, inclined to produce a squatness in the final result which is accentuated by wide bore cylinders. In an endeavour to overcome this and other problems a mock-up of the model now described was first constructed in "O"-gauge to determine basic features in conjunction with general outline drawings of the V1/3 tank locomotives obtained through the courtesy of the C.M.E. to the L.N.E. Railway. To keep the job straightforward, the inside cylinder was omitted, the two retained having $1\frac{5}{8}$ in. bore by $2\frac{1}{8}$ in. stroke, the latter corresponding to 26 in. full size. The castings then available necessitated the use of cylinders with slide-valves having dummy ends to simulate the piston variety.

Construction started while I was serving in the C.M.F., so that materials and tools available locally governed the methods employed. Small screwing tackle was limited to $\frac{1}{8}$ in. and $\frac{3}{16}$ in. Whitworth, which was used to adapt screws and bolts with metric and American threads. This improvisation has not been satisfactory under running conditions because coarse-pitch threads work loose and they are gradually being replaced by appropriate B.A. sizes.

The frames were cut from some $\frac{3}{16}$-in. mild-steel plate originally part of a bulkhead in the coal-bunker of a ship. Another piece of useful material picked up in Italy was a length of steel rod used for reinforcing concrete. From this rod, frame-stays, axles, crankpins and suchlike were

made, but time alone will prove its wearing qualities. Fastening of the frames generally is by angle-iron and rivets, the former being bent up from plate which was also used for pre-fabricating parts such as the smokebox saddle and link brackets. In early steam trials the latter, as might be expected, proved insufficiently



strong and have had to be reinforced with welding; some time, completely new ones must be made. Ordinary horn blocks were out of the question, so massive axle-boxes were cut from cast brass and slotted by hand to fit the frame openings, additional support being provided by over-size spring spindles which pass through specially stout keeps.

The driving wheels, $5\frac{1}{2}$ in. in diameter, were obtained from the U.K. but the small ones were cast in Palestine from patterns made by hand. Blanks for the motion parts were forged from mild-steel bar and finished with hacksaw and file, channelling being done on the edge of an emery wheel.

The side tanks and cab have been made from 20-gauge black steel sheet, flush-riveted or brazed as appropriate. The whole of this sheet work is a single unit which, if required, can be unscrewed from the brackets on which it rests and lifted from the frames.

The boiler was " made to measure " for me by Messrs. Dick Simmonds & Co., to whom I am grateful also for technical assistance in the layout and final construction of the cylinders and motion work which has contributed so materially to the remarkable success of the model. The boiler, pressed to 100 lb., is of copper and contains sixteen $\frac{1}{2}$-in. fire tubes and two $\frac{7}{8}$-in. superheater flues, the general design being that advocated by "L.B.S.C." For the smokebox, a length of copper pipe of the correct diameter was found but no castings were available for the rings or door. The front ring was made finally from an old steel pulley, and the rear one from a slice off a large phosphor-bronze bush. The door was dished from brass plate in the usual way, a register soldered round and the whole turned up in the lathe.

The boiler feed is by two conventional axle-driven pumps and an auxiliary hand-pump in the bunker. Of greater interest may be the method employed for carrying adequate water. The whole rear bunker except for the coal gallery, is occupied by a tank fastened to the frames inside the sheet steel casing described. This tank which holds one gallon should properly be made from sheet brass, but being unable to obtain any, lead-covered sheet steel, similar to that for petrol tanks, was used. This material is supposed to be rust-proof, but it is definitely not. Fortunately, the provision of a drain-cock and an internal application of tar and paraffin, followed by heat,

seems to have cured the trouble for the moment.

Several experiments were necessary to obtain satisfactory mountings for the front and rear trucks. In the preliminary mock-up these were carried on radially-moving brackets which, to avoid excessive length, pivoted at a point level with the tyre of the nearest driving wheel. For the larger model the front truck was arranged similarly, but, at the rear, radial boxes and plenty of axle side-play were provided. On the most moderate curves, derailments of the trucks were so frequent that the whole design was altered. The front bracket was lengthened sufficiently to have its centre of radius opposite the leading driving-axle. A tranverse member of $\frac{1}{8}$-in. plate was fixed as far forward and as low as possible in the main frames. To this were riveted two spring-loaded plunger housings, the plungers passing through the plate and pressing down on the bracket carrying the leading wheels. A similar scheme was adopted at the rear, but to obtain really satisfactory results it was necessary to cut away the main frames to allow adequate side-play for lateral wheel movement; fortunately, this mutilation is hardly noticeable.

For the moment, fittings have been confined to bare essentials, but, as time permits, there will be ample scope for refinements such as injector boiler feed, working brakes and sanding gear. A hole in the cab roof provides ample access to the fire-hole, footplate and the pole reversing lever.

The initial steam trials were rather fun. Through force of circumstances, the only track then owned was laid on a bomb-site of unusual contours. A 200-ft. run could be obtained by starting at basement level and rising up 1-in-20 round a curve of 50-ft. radius. With practice, two adults could easily be hauled up this; the real excitement was descending. A new continuous track is now under construction, and will provide adequate scope for this and other models. At present, the haulage capacity of the model appears to be limited solely by the amount of rolling-stock available.

PRACTICAL LETTERS

International Model Racing Events

[The following letter was submitted to the Editor of *Model Car News* for publication in that journal, but in view of the fact that it deals with matters of policy applicable to other types of competition models than model racing cars, it has been considered desirable to publish it also in these columns.—ED., " M.E."]

DEAR SIR,—The editorial comments in the October issue of *Model Car News* regarding the possibility of International model car racing prompt me to write a few words on at least one aspect of such events should they ever come into being.

For some little time now, I have been pondering on the present trend of model car racing in this country, and just how we should be placed should we ever be called upon to select a team for International races. First, what constitutes an International event? My own interpretation of the term, is the matching (pitting) of one nation's skill against that of another in friendly competition, with the competitors being true representatives of their own country. For instance—a Scottish International football team does not (I believe) enlist the aid of Frenchmen in their side when playing an International match, no matter how good a player or players the Frenchmen may be, or how much they may be needed.

Would it not be correct, therefore, for International model race car teams to enter and compete only with cars and engines that are a product of the country they represent?

I can almost hear the howls of anguish emitted by those who are today running non-British engines and cars when they read the above, but please consider the situation from a national and *not* a personal standpoint.

Surely the use of cars and equipment in such an event, that were not entirely British, would almost amount to defeatism and render the use of the word " International " a farce. It is well known that at the present time the U.S.A. is fairly well ahead in the model race car world, as far as sheer speed is concerned, but they are far from being the only other country with whom we should be likely to compete, and I ask you, would it not be a very hollow victory were we to win an International race by using cars or engines that were not " British Made " ?

The same thing, I feel, also applies to National Records. More howls of protest !!?

Well, if John Cobb runs his car at record speed in America, said car being designed and made in Britain, is it an American record? Hardly! " Goldie" Gardner's M.G. does some rapid runs in Belgium—Belgian record? Decidedly not!

" Ah," someone may say, " but those are *world* records." Is it incorrect then to surmise that the fellows running American engines, *no matter in what part of the world they live*, have about 130 m.p.h. to beat in order to claim a record, for that is the world and U.S.A. speed record to date? It is really a question of " To whom does a record belong if one is set up, the owner or *maker* of the car ? " Please remember that in the case of model race cars hardly a fraction of skill or credit *need* be necessary on the part of an owner these days, other than the ability to pay out a considerable amount of hard cash! Hard words perhaps, but are they not true ones?

By no means should anyone be prevented from buying and running as many makes and types of cars as he desires, but when it comes to National Records or International events, is it too much to suggest that the only cars eligible for these (in our case) be British made?

Maybe some of these ideals are too high—maybe not, but if there should be a discussion on

the matter, as I hope there will be, may I gently remind intending participants that in our own small way we should endeavour to further the prestige of our *own* country, and this we cannot do by taking the line of least resistance and using another country's products in our attempt to secure our own National records or International victories.

Yours faithfully,

Stoke on Trent. F. G. BUCK.

Model Locomotive Control

DEAR SIR,—In THE MODEL ENGINEER for December 16th is a most interesting article by G. Rhodes on auto-control for locomotives. I should think this would appeal to many who would like to see their locomotives run unattended, and perhaps the author could give a few details and drawings of his application?

Yours faithfully,

Maidenhead. F. H. HARMSWORTH.

CLUB ANNOUNCEMENTS

South London Model Engineering Society

The next meeting will be held on Sunday, February 13th, at Kings College Sports ground, Dog Kennel Hill, East Dulwich, S.E., starting at 11 a.m. Mr. Philpot, a junior member, will describe the building of his Rainhill type locomotive.

Particulars as to membership can be obtained from the Hon. Secretary, W. R. COOK, 103, Engleheart Road, Catford, S.E.6.

The Southern Federation of Model Engineers

The Federation held its annual meeting on Sunday, January 9th, at Southampton, when Mr. Butler, of Southampton, was elected chairman, Mr. T. A. Bedford, vice-chairman, and Mr. G. Williamson was elected secretary-treasurer, 1949.

The question of stewarding at the "M.E." Exhibition was debated and it was decided that the Exhibition Manager should be asked to adopt the suggestion put forward by the members, the chief concern being the protection of the exhibits from mishandling during the show.

Another subject which received quite a good floor, was the news that the Board of Trade intended to extend the P.T. on model engineering accessories. A strong protest, in the form of a resolution was sent to M.E.T.A., who were meeting the Board of Trade on the issue, on behalf of the societies represented.

In connection with exhibitions, the Federation are desirous of setting up a panel of judges who would be willing to act in that capacity, and also a recognised scale of points, on which such a panel can base its adjudication. The retiring chairman, Mr. T. A. Bedford, and secretary, Mr. R. Pemble, thanked the representatives for their past confidence and assistance which had made the Federation possible, and their work the easier, and assured the new officers of their sincere support.

Sec.-treasurer: G. WILLIAMSON, 23, Tintern Road, Gosport, Hants.

South Eastern Association of Model Engineers

The association regatta under M.P.B.A. rules will be held on South London's water at Brockwell Park, Herne Hill, on May 15th, starting at 10.30 a.m.

All clubs should make a special effort to be represented at the meeting to be held at Crantock Road, Bromley Road, Catford, S.E.6, on Tuesday, February 8th, at 7.30 p.m.

Hon. Secretary: W. R. COOK, 103, Engleheart Road, Catford, S.E.6.

Sutton Coldfield and North Birmingham Model Engineering Society

The above society, which was formed about 10 weeks ago, now has 40 members, and would welcome anyone in the area who is interested.

The following meetings have been arranged to take place, at 7.30 p.m., at the Station Hotel, Station Street, Sutton Coldfield on Tuesdays, February 15th, March 1st, March 15th, and March 29th.

Hon. Secretary: C. D. PRIESTLEY, 43, Park Road, Sutton Coldfield, Warwickshire.

Edgware and District Society of Model and Experimental Engineers

Future meetings of the above society are :—

February 8th. Annual general meeting. This will be held in the Common Room, at the Canons Park Community Association, at 7.30 p.m.

February 15th. Rummage Sale. Members are asked to support this event with any unwanted tools, materials, and books, etc. Time, 7.30 p.m.

February 22nd. A talk by Mr. K. N. Harris, of the Kodak Society and the S.M.E.E., illustrated with lantern slides. This will take place in the workshop at 7.30 p.m.

March 8th. "Models Night." This will be a private exhibition in the workshop of members' work done during the last six months or so.

Workshop Nights. March 1st, 15th, 29th, April 12th, 26th.

Amongst our recent additions to the workshop equipment, we have a fine new ½ in. drilling machine, for which the Committee wish to thank Mr. Kenniston.

We have also been presented with a large tool box complete with trays. This has now been fitted with clasp and eye and lock, and is available for the storage of members' tools, etc. This was kindly presented by one of our new members, Mr. Hall.

Edinburgh Society of Model Engineers

The first of our inter-club meetings was held recently when about twenty members from the Glasgow society paid a visit. A pleasant afternoon and evening was spent and many old acquaintances were renewed.

Our next outing is to the Museum workshops on February 18th, at 7.30 p.m.

The power boat section is now in full swing and all model-makers interested are welcome.

The workshop and clubroom, 1a, Ramsay Lane, Off Lawnmarket, Edinburgh, are open on Tuesday and Thursday evenings after 7.30 p.m. and Saturday afternoon after 3.30 p.m.

Hon. Secretary: JAMES H. FARR, Wardie Garage, Ferry Road West, Edinburgh, 5.

Andover and District Model Engineering Society

The annual meeting of the above society resulted in the executive being re-elected for 1949. The treasurer's report shows the club to be sound financially, and the Workshop Committee reported steady progress in the electrification of the premises.

Preliminaries of the annual exhibition were tabled, the secretary outlined the committee's recommendation for a "better than ever" show this year.

At the close of the meeting, Mr. Meechan, the chairman, thanked the members for their past support and confidence in their executive, and wished all members of this society, the Southern Federation and the model engineers the world over, a happy and prosperous 1949.

Hon. Secretaries: R. PEMBLE, 14, Weyhill Road; F. VALLAT, 8, Walnut Tree Road, Andover.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. **All such correspondence should be addressed to the Editor (and not to individuals)** at 23, Great Queen Street, London, W.C.2. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2.

Correspondence relating to display advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 23, Great Queen Street, London, W.C.2.